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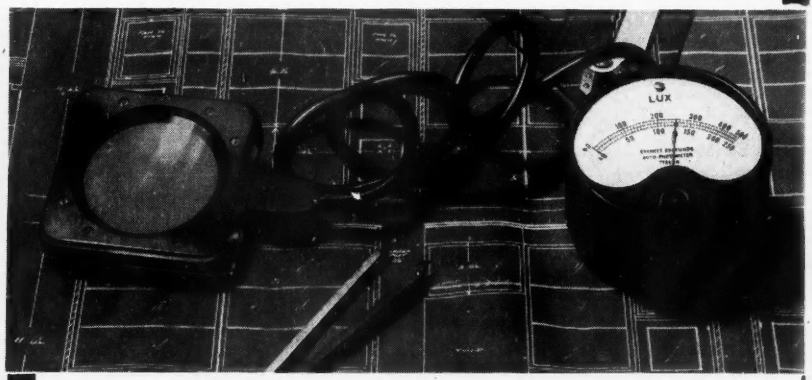

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On right: *Typical scale showing sensitivity at low illumination values.*

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ELECTRICAL
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Vol. CXLIX No. 3857 26TH OCTOBER, 1951
THE OLDEST ELECTRICAL PAPER ● ESTABLISHED 1872

Public Electricity Supply

SOME COMPARISONS WITH OTHER COUNTRIES

THE value of taking stock of the development of public electricity supply in Great Britain against a background of what is being done abroad was demonstrated by Sir John Hacking in his presidential address to the Institution of Electrical Engineers, reported in our last issue. Taking first the construction of generating plant to make up the leeway due to the war, the capacity in other European countries had by last winter reached the stage at which it was generally able to meet the demands upon it.

Manufacturing Resources

In this country, although the rating of new plant provided last year was greater than ever before, the gap between kW installed and kW of maximum demand has grown wider and seems unlikely to be closed for several years. It is not that manufacturing resources are inadequate but that, with the claims of export, only about 40 per cent is available for the purpose. No alleviation has come from Marshall Aid as it has to some countries.

No doubt the formerly high standard of reliability of supply enjoyed here compared with that often found abroad makes any deficiency more keenly felt. There has been only one serious failure of indigenous raw material, coal (in 1947), whereas vagaries of rainfall have frequently reduced very considerably output in countries that depend wholly or partly on water power. On the other hand lower costs of energy in such countries are reflected in heavy consumptions for chemical and metallurgical processes. Omitting Scandinavia and Switzerland and also the United States where hydro-electricity forms one-quarter of the total, Great Britain heads the list of countries for total kWh consumed per head of the population.

Although Unipede statistics differentiate only industry and traction from other applications, they show that the large miscellaneous group is as well served here as in the United States and better than in any European State except Switzerland. Everywhere, however, the high proportion of these numerically preponderant consumers provides evidence of the " public's choice " of electrical methods.

Less Private Plant

Another indication of good service may be deduced from the figures given in the address. It is that industry in Great Britain is notably more dependent on public supply than in any other country. Private plants account for

only 13 per cent of the whole consumption, against 18 per cent in the United States and 20 to 45 per cent on the Continent. Any relief their present surplus capacity could afford to the grid is consequently likely to be small.

The stern necessity of devoting attention mainly to short-term measures has not prevented the taking of thought for the future. The prospects revealed by Sir John seem reasonably bright and also feasible, provided always that the industry is allowed to work out its own salvation. Apart from progress in generation there are technical advantages in nation-wide co-ordination (including that of transmission) that have still to be exploited. Outstanding is the projected 275 kV grid, which among its other merits is expected to make electrical transmission more economical than the transport of coal (thus, incidentally, relieving the railways) and, through diversity, to reduce the generating capacity necessary. The research activities to which the President alluded open up possibilities of benefits to consumers in ways that may not yet be envisaged.

FORESHADOWINGS

In his presidential address to the Association of Supervising Electrical Engineers, reported on another page, Mr. T. G. N. Haldane referred to a number of developments which should rehabilitate the reputation of the British electricity supply industry for reliability and pioneering achievement. An overriding requirement, however, as he pointed out, is that the attention devoted to them should not entail the diversion of capital, materials and labour from the installation of enough generating plant. That primary purpose is likely to delay the use of many desirable improvements, but should not delay the construction of the 275 kV grid. Pumped storage and ripple control, which he mentioned, should be fully considered as, if feasible, they would be developments of permanent value, since the levelling of the load curve will always be desirable.

INCREASING PRODUCTION

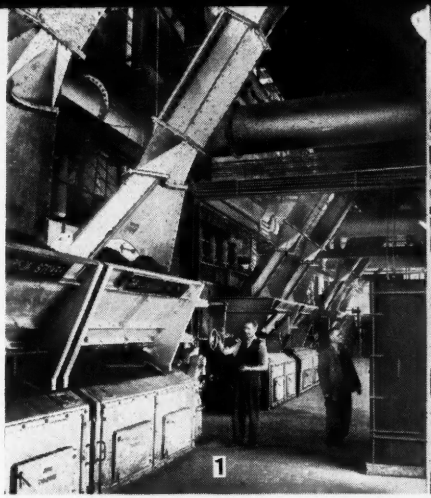
Many " teams " have visited the United States under the auspices of the Anglo-American Council on Productivity and in their reports have indicated how production might be improved by following certain American practice. We believe the British Steel Founders' Association is the first body to report results from the adoption of some American ideas. Ten members have provided the Association with particulars of the benefits derived. In most of them substantially increased output has followed improved plant, layout and methods; two firms refer to results from research; and one increased its output by 50 per cent by specialization and a selective sales policy. We hope, in due course, to learn whether any electrical manufacturers have derived tangible benefit from the reports submitted by electrical teams which have visited the United States.

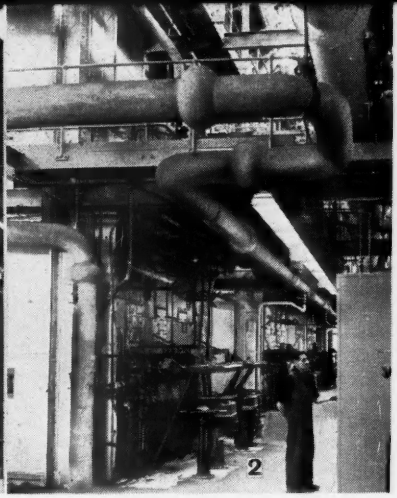
" FREE " SERVICES

The question of payment for consumers' services continues to crop up all over the country. It has now been raised by the Scottish Gas Consultative Council which is protesting to the Minister of Fuel and Power against " unjust practice " on the part of the electricity supply authorities. The latter say that they can only put in services free of charge if consumers agree to use electricity for lighting, heating and cooking. If lighting alone is required the local authority is asked to meet the cost of the services. This practice is not unjust; " free " services which do not pay their way are subsidized by other consumers. In palmier days services could be provided for lighting only, in the first place, with a reasonable hope that the consumers would extend their use of electricity to other purposes. At the present time, however, when so many attempts are being made to discourage electricity consumption, this is a poor speculation.

LOAD SPREADING AND OVERTIME

Industrialists who are asked to spread their electrical load by extending working hours have to look at the probable added labour cost of doing this. It is of interest to record, therefore, that in Leek (Staffs) textile manufacturers and their employees have reached an agreement on wages to be paid in " adjusted " hours. By this overtime rates will be claimed only for work before 7.30 a.m. or after 7.15 p.m. on weekdays and after 12 noon on Saturdays. The agreement will not apply to mills in which private plant is in use.





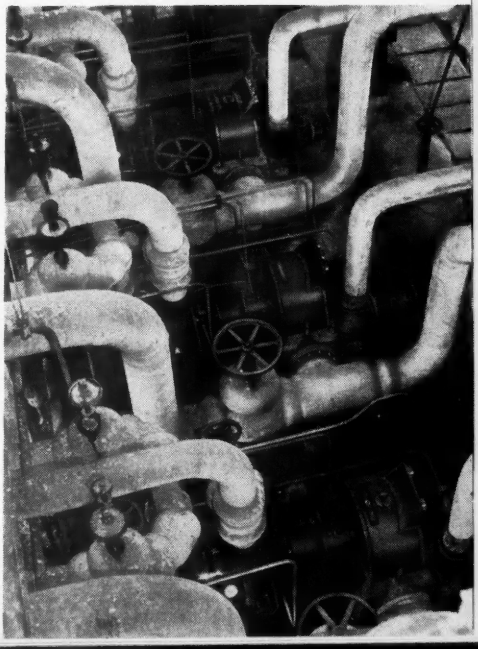
Steelworks Electricity—I

Public Supply, Private Generation and Distribution at Port Talbot

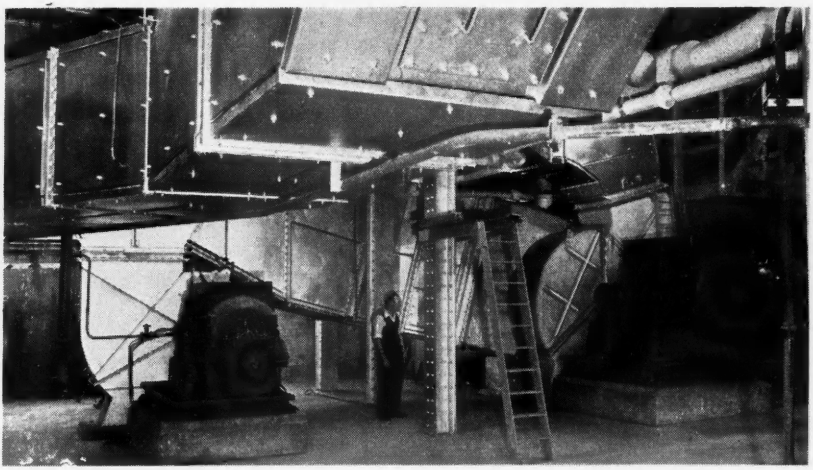
AT the time of the inauguration by Mr. Hugh Gaitskell, Chancellor of the Exchequer, of the exceptionally large new steelworks at Port Talbot of the Steel Company of Wales, Ltd., we published a general article on the establishment (27th July). This was introductory to a series describing the various sections and the present article, the first, deals with the electricity supply scheme, embracing public supply, private generation and distribution.

We regard this scheme as unique from almost every electrical aspect, and emphasize that it is one complete scheme for one integrated works, covering as a whole the initial works sites at Port Talbot, Margam and Abbey.

Constructional work is still going on, and will proceed for a long time to come. But, with the exception of cold rolling, the principal sections of the plant, including coal handling and the coke ovens, ore handling and the blast furnaces, the melting plants, slab rolling and continuous hot rolling, are all now in production with new equipment employing modern electrical methods. Here and there one finds small components of the older systems now working temporarily or semi-permanently as part of the new integrated system, but



Above: (1) A third steam supply is taken from stoker fired boilers at 300 lb sq in. (2) The 87,200 lb/hr boilers at the power station are fired mainly by blast furnace gas
Right: Feed water is served to the economizer by three steam turbine driven and two motor driven pumps



The air system incorporates one f.d. and one i.d. fan for each boiler, both in the basement

we have made no attempt to exclude these from our description.

At Trostre, some 25 miles west of the main works, there is another works, as yet in the constructional stage, which will deal in the main with the cold rolling of tinplate. Although from the production aspect this works must be regarded as part of the major plant, it is served by its own electrical distribution system, and in view of our proposed scheme of presentation of the electrical story as a whole, which will include subsequent articles dealing with the electrical applications to production, it is necessary to make this point quite clear when we are emphasizing the continuity throughout the new works of the electrical distribution system.

There are six sources of supply at the new major works. These include two 66 kV transmission lines direct from the Llynfi power station of the South Wales Division of the B.E.A., a third 66 kV line from Pyle public supply substation, a fourth 66 kV transmission line tapped off the St. Johns-Rheola interconnector on the South Wales Electricity Board's system, an 11 kV line from the Pyle substation, and finally the works power station. The 11 kV line from Pyle substation is a stand-by supply.

We will deal with the works power station first, not because it comes first in respect of size (indeed, it meets only about 25 per cent of the total electricity requirements) but because of the way in which it is dovetailed into the power supply scheme for the works as a whole and because of its role in the economics of the works operation. The power station is far from complete; the new plant is being installed while some of the older plant is still in production, and the first new turbo-alternator was put on load during our first visit only a few weeks ago. But we propose to describe the station as if it were already completed.

The main design principles of the power plant are, first, that it is operated on only waste heat products from the three main works—surplus blast furnace gas and coke oven gas, and waste heat from the melting furnaces.

Secondly the private electricity generation is a secondary item which varies according to the amount of waste heat available. The main outputs of the power station in order of priority are: blast air for the blast furnaces; process steam for oil burners in the melting shop furnaces, turbo-exhausters at the coke ovens and such details as steam pumps and gas seals at the coke oven by-products plant; and cooling water for various works purposes. The steam demand is vital and must be met at all times.

The blast furnace gas supply to the power plant is a variable quantity, dependent on

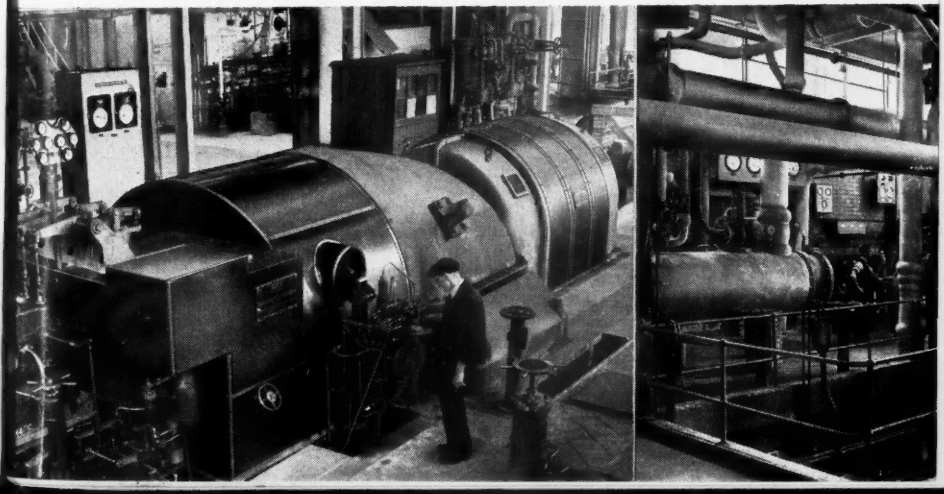
For general service water supplies there is a battery of vertical motor driven pumps

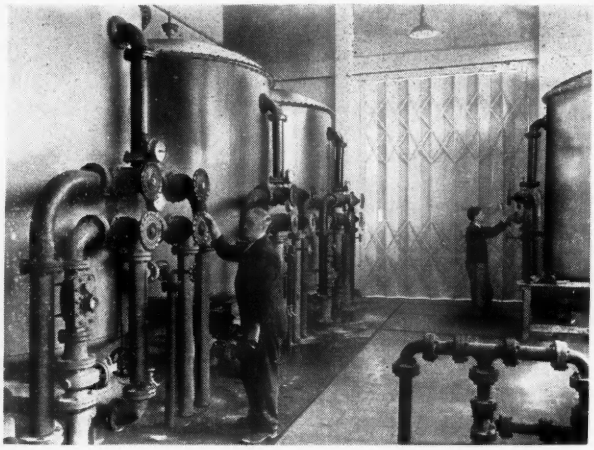
the requirements of production processes, so that the Power Department must regard the private electricity generation as a last " priority," and then only according to the amount of surplus gas available at any one time.

The first output from the power station high pressure boilers is to the turbo-blowers providing the blast air, while the second output from the same boilers is to the turbo-alternators which are arranged for output governing by steam pressure. A second steam supply is from the waste heat boilers at certain sections of the production plants at 160 lb/sq in, while a third steam supply is taken from John Thompson stoker fired boilers at another works section at 300 lb/sq in. The process steam supply is at 160 lb/sq in. These pressures are kept constant by means of a 1,800 kW double pass-out back-pressure turbo-alternator set.

A further vital consideration is the reliability of the turbo-blowers, and because of this the turbines of these have no condensers. The exhaust steam, which is at slightly above atmospheric pressure, is fed into a common steam main which serves, in turn, the low pressure stages of the three 8,000 kW turbo-alternator sets, thus avoiding " outages " on account of condenser maintenance and cleaning.

Left: Directly supplied from the h.p. boilers are three blowers and three (one shown) 10 MVA turbo-alternator sets. Right: From the secondary pass-out point steam is passed to l.p. feed water heaters



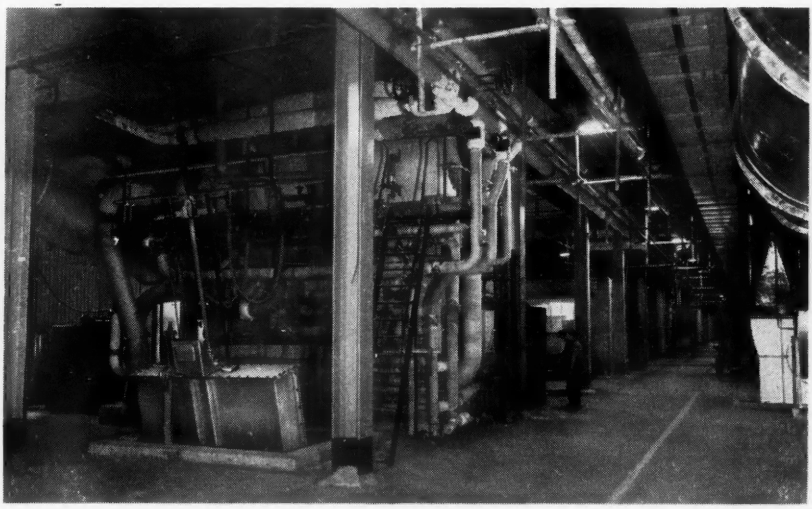


Comprehensive water purification plant treats raw water for boiler feed and other purposes

There are four 87,200 lb/hr high pressure water tube tri-drum twin flow boilers supplied by Simon Carves, Ltd. These boilers are designed to burn the main blast furnace gas, but there is also provision for burning coke oven gas and oil. The general arrangement is that blast furnace gas can be burnt with either coke oven gas or oil; the two cannot be consumed together. The same burners serve for either of these two heating media.

The boiler steam conditions are 625 lb/sq in and 820 deg F. Each boiler will burn 1·35 million cu ft of 92 B.Th.U./cu ft blast furnace gas per hour. The coke oven gas which supplements this at times has a heat value of 500 B.Th.U./cu ft, and the calorific value of the oil for further supplementary firing is 18,000 B.Th.U. There are four S.C. 30-jet blast furnace gas burners per boiler and two Peabody coke oven gas or oil single-jet burners. The economic operation levels of each boiler are 69,700 lb/hr when blast furnace gas is used alone and 45,600 lb/hr when either coke oven gas or oil fuel is used.

Each of the waste heat boilers produces 17,000 lb of steam an hour at 300 lb/sq in



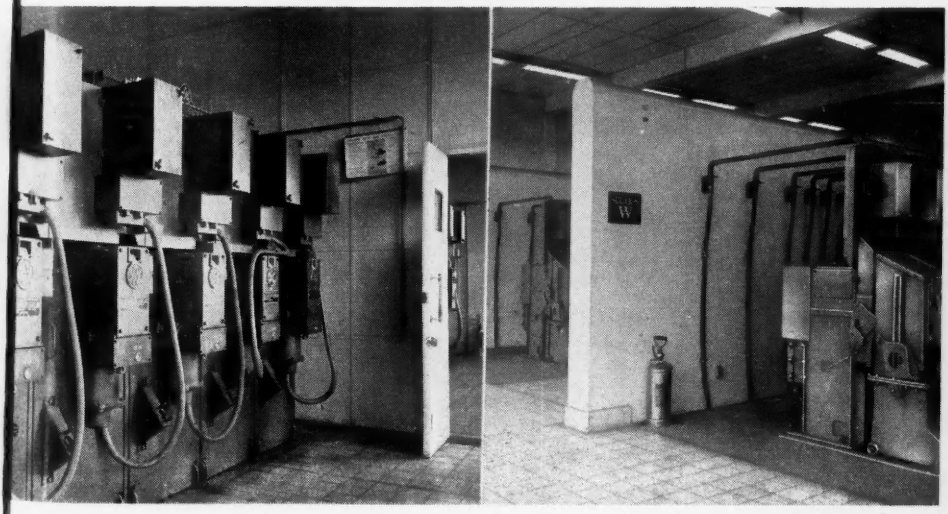
All the burners inject at the front of the combustion chamber which has a volume of 5,560 cu ft. The total heating surface of the boiler itself is 11,315 sq ft, including the 2,800 sq ft of the " Melesco " horizontal self-draining superheaters, while the Green's " Premier Diamond " economizer, which is designed to raise the temperature of the feed water from 250 deg F to 446 deg F, has a total heating surface of 11,845 sq ft. The feed water is served to the economizer by three steam turbine-driven and two motor-driven Mather & Platt feed pumps. A comprehensive water purification plant by Filtrators, Ltd., will treat 30,000 gallons of raw water an hour for boiler feed and other purposes by sludge blanket sedimentation using lime and aluminium sulphate in " Hydrotreator " equipment, followed by base-exchange stabilization in pressure vessels. For general service water supplies there is also in the power house a battery of vertical 290 h.p. motor-driven pumps supplied by Sulzer Bros.

Howden tubular air heaters are provided to raise the temperature of combustion air from 80 deg F to 340 deg F, and the overall heating surface of each air heater (one per boiler) is 12,800 sq ft. The air system incorporates one forced draught fan and one induced draught fan per boiler, both by Howdens, and installed in the basement, although the intake air comes from the top of the boiler house. In each case the boiler flue gases are discharged to a 105ft high steel chimney. Steam temperature is automatically controlled on the principle of flue gas recirculation. A by-pass damper at the induced draught fan outlet is operated by a Bailey control unit actuated by the steam temperature.

Other apparatus which forms part of this boiler control system are the automatic gas controller, the furnace combustion chamber pressure controller, the Copes feed water regulators, the " Flowmatic " controller, which is operated by the superheated steam inlet and outlet pressure differences, and the James Gordon " Igema " water level indicators.

In the turbine house, directly supplied from the high pressure boilers just described, are (or will be) two 80,000 cu ft and one 60,000 cu ft turbo-blowers and three 10,000 kVA turbo-alternator sets, all products of the General Electric Co., Ltd. The blower turbines exhaust at a back pressure of 0·5 lb/sq in gauge into an atmosphere steam main which is connected to the low pressure stages of the turbines,

Left: The 8,000 kW alternators are controlled by 11 kV circuit breakers on the main power station switchboards. Right: The 1,800 kW alternators are controlled by circuit breakers on the 3·3 kV sectionalized switchboards at the power station



The power station control room is one of the three control rooms for the whole supply and distribution system

which stages take up to 90,000 lb of steam per hour. To reach full load, however, some 38,000 lb/hr of high pressure steam is fed to each turbo-alternator turbine directly from the boilers. These turbines are governed either by steam pressure or speed.

At times of low load the alternators can be run as synchronous condensers for power factor correction on the system as a whole, and at such times the exhaust steam from the turbine h.p. stages, through which the steam is allowed to pass to prevent overheating, goes to a Worthington Simpson condenser which will deal with 130,000 lb of steam with 28·5in of vacuum. The condenser cooling surface is 17,000 sq ft.

The main alternators generate at 11 kV. The 1,800 kW double pass-out back-pressure turbo-alternator set generates at 3·3 kV. It takes steam at 300 lb/sq in and passes it through the primary outlet at 160 lb/sq in, at which pressure it is desuperheated by an Arca equipment to serve the process steam main at the rate of 40,000 lb/hr when the turbine is receiving 73,000 lb/hr. At the secondary pass-out point the steam pressure is 30 lb/sq in and this steam is passed to Hick Hargreaves feed water heaters, two of which operate at 30 lb/sq in and two at atmospheric pressure. All told these heaters will raise the temperature of 300,000 lb/hr of feed water from 150 deg F to 250 deg F.

The turbine of this auxiliary alternator set will also exhaust at just above atmosphere to the atmosphere steam main which serves the low pressure stages of the turbines on the main alternator sets and the low pressure feed heating system. Here again governing is either by steam pressure or speed. Under steam pressure governing the process steam pressure takes precedence over electrical output and the primary pass-out pressure is maintained. On speed governing the normal steam conditions are obtained from the make-up steam passed on from reducing valves.

The high pressure steam main supplying the major alternator sets and the blower turbines at 650 lb/sq in also serves the medium pressure main through reducing valves with steam at 300 lb/sq in. Each of these valves will pass 30,000 lb of steam per hour and there is an overflow valve which will operate at 625 lb/sq in and above. The medium pressure steam system is also linked up with the waste heat boilers in the production plant.

Each of these John Thompson "La Mont" boilers produces 17,000 lb of steam per hour at 300 lb/sq in and 750 deg F. Steam at medium pressure is also passed on to the process steam system (160 lb/sq in) through 60,000 lb/hr Arca reducing valves. At the same time the steam is desuperheated to 470 deg F. There is also a Holden & Brooke steam transformer which

is served with steam at the medium pressure conditions to produce 10,000 lb of steam per hour at 160 lb/sq in from feed water at 60 deg F. The condensate from the transformer is returned to the normal condensate system.

The 8,000 kW alternators are controlled by 11 kV 250 MVA circuit breakers on the Allen West main power station switchboards. The 1,800 kW alternators are controlled by 75 MVA circuit breakers on the 3·3 kV Metrovick sectionalized switchboards at the power station. The power station control room, with its Allen West 11 kV board and alternator control desks, Metrovick 3·3 kV board, Bailey meter board and Clifford & Snell desk-type annunciator panel, is one of the three control rooms for the whole supply and distribution system.

Having thus given a little special attention to the works power station on account of its particular electrical interest in the economic working of the power plant as a whole, we must now, in order to see all components in their correct perspective, let it take its proper place in the supply and distribution system as just one of the six electricity supply sources which are available at the works.

New E.D.A. Films

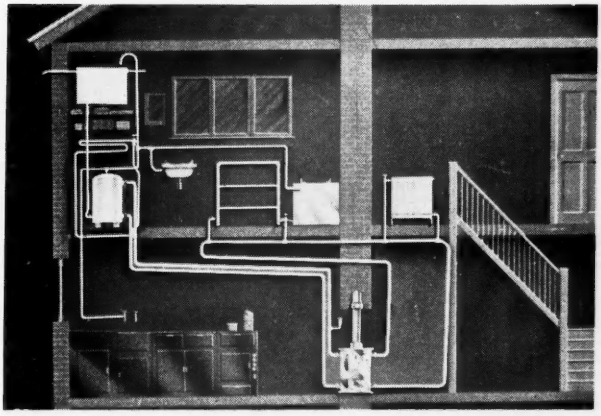
Lighting and Hot Water Systems

TWO new 16 mm films produced by the Merton Park Studios for the British Electrical Development Association were shown to representatives of the technical and trade Press last week. Both are educational in character but they are designed for different types of audience.

The first—" Out of the Dark "—is suitable principally for use in schools and deals historically with the progress of " artificial " illumination from the earliest time to the present day, emphasis being placed naturally and rightly on electricity. The presentation of the subject is in the capable hands (and voices) of Dr. Arthur Bryant, the historian, and Professor E. N. da C. Andrade, Director, Royal Institution of Great Britain.

The second film is of a more practical nature, dealing with the installation of hot water systems. The principles involved are clearly demonstrated by means of actual examples, diagrams and flat models, attention being paid to erroneous as well as correct methods. In this case the commentary takes the form of a lecture by an engineer who is seen with a confrère from time to time. This arrangement and occasional " shots " of other people impart " human interest " which may be considered superfluous in a practical film but, on the other hand, may make it more palatable to apprentices and other learners. With the film goes a handbook on electric water heating and strips of the film for static exhibition are also available. Together they should prove a useful form of instruction.

The Association has now produced 22 educational films, two farming films and 15 on general subjects. It has 700 copies available and 1,450 have been purchased by educational authorities and other organizations.



In the E.D.A. film " Electric Water Heating " effective use is made of adjustable flat models of water vessels and piping

Radiant Boiling Plates

Life Tests Carried Out in Sweden

By R. CZEPEK*

INVESTIGATIONS which have been conducted over a long period in Sweden are reported to have shown, as has already been announced in Germany,† that chromium-aluminium-iron offers advantages over nickel-chrome alloys for use as heating elements for tubular radiant boiling plates. The results indicate that they have a substantially longer life, even with a much higher surface loading. In addition the consumption of energy remains almost constant, thus causing no appreciable increase in boiling time, and the insulation resistance tends to rise with age. The samples tested (Figs. 1 and 2) were rod type surface elements consisting of two adjacent heater coils embedded in fused magnesia powder contained in a triangular tube of nickel-chrome steel (75 to 78 per cent nickel and 15 per cent chromium). The powder weighed 3·15 to 3·2 gm/cm³. The diameter of the unit was 145 mm external (1in equals 25·4 mm) and 65 mm internal. Rated loading was 1,200 W at 230 V. Other characteristics in common were: winding, external diameter, 2·8 mm; extended winding length, 800/630 mm; total surface area, 267 cm²; effective heating area of tube, 80 cm²; heated tube length, 620 mm. Features variable as between units are shown in Table 1.

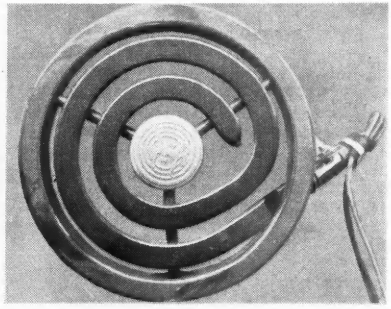
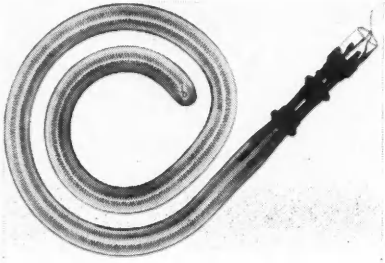


Fig. 1.—Rod-type surface test unit No. 2 at 240 V, 1,250 W; weight 1 54 lb, periphery of equilateral triangle, cross-section of the tubular heater 40 mm

Fig. 2.—Radiograph of test unit No. 2 showing chromium-aluminium-iron wire before test



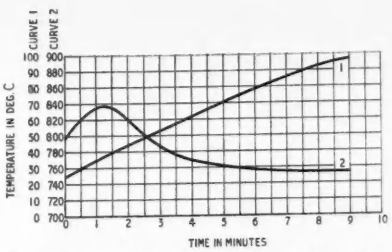
Preliminary experiments had indicated that the nickel-chromium wire used had a 10 to 20 per cent longer life at 1,000 to 1,100 deg C than had four others of different origin. Owing to its higher specific resistance, the chromium-aluminium-iron wire is shorter for the same diameter than the nickel-chromium and the consequently higher surface loading would allow a saving in weight of 30 per cent. Using the same length of wire, the diameter could be enlarged, without reducing the pitch of the winding, to permit lower surface loading and hence longer life.

The units were operated without cooking vessels for an initial period of 3,800 hr at 230 V and then at 260 V, in both cases intermittently, one hour on and one off, until a fault appeared.

The time characteristics of a unit (No. 6) when heating two litres (1 imp gal equals 4·54 litres) of water in an aluminium vessel with a loading of 1,500 W are shown in Fig. 3; curve 1 refers to water temperature and curve 2 to the variation of mean temperature of the tube surface, starting

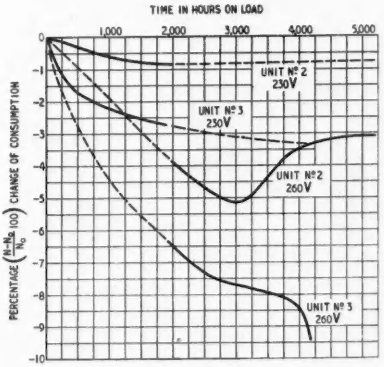
* Aktiebolaget Kanthal, Hallstahammar, for which the sole agents in the United Kingdom are Hall & Pickles, Ltd., Manchester, 1.

† *Elektrowarme-Technik*, No. 4, October, 1950.



Curve 1 is temperature of water and curve 2 is variation of mean temperature of tube surface

Fig. 3.—Temperature characteristic of a surface unit when heating two litres of water with a loading of 1,500 W



N is power consumption with time and N_0 is initial consumption at 230 V and 260 V

Fig. 4.—Percentage changes in consumption of No. 2 unit fitted with chromium-aluminium-iron heater and of No. 3 unit with nickel-chromium heater, both rated at 1,250 W

with the element hot at the instant of superimposing the vessel. The efficiency was

$$\frac{1{\cdot}16 \times 2\ (95-25)}{1500 \times 0{\cdot}14} = 77{\cdot}5 \text{ per cent.}$$

Percentage variations of energy consumption with time are shown for chromium-aluminium-iron (unit No. 2) and for nickel-chromium (unit No. 3) in Fig. 4. At 230 V the consumption of unit No. 2 fell to a notably less extent than that of unit No. 3. Whereas the figure for the chromium-aluminium-iron heater after a period remained nearly constant with a slight tendency to rise later, that for the nickel-chromium continued to decrease. At 260 V the difference was even more marked, the percentage reduction of 8·5 for chromium-nickel at 4,000 hr being in excess of the amount permissible by international standards. On the other hand the self-compensating effect for the chromium-aluminium-iron became more pronounced. The reason for the latter effect is that the specific electrical resistance of ferritic chromium-aluminium-iron alloys which have been kept at a glowing temperature falls with the passage of time because of the loss of aluminium.

Electrical insulation was investigated by

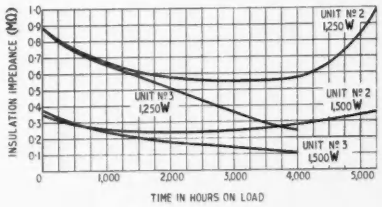


Fig. 5.—Variations with time of insulation resistance of unit No. 2 fitted with chromium-aluminium-iron heater and of unit No. 3 with nickel-chromium element, each of two loadings

TABLE I.—Variable Characteristics of Heating Element Wire

Units Nos. 1 and 4, A quality and Nos. 2 and 5 D quality Kanthal wire. Units Nos. 3 and 6, 80 per cent nickel with 20 per cent chromium alloy wire.

Unit No.	Element material	Wire diameter mm	Surface loading 1,250 / 1,500 W/cm²	Mean pitch of winding mm	Initial resistance of element cold, ohms
1	Cr-Al-Fe ..	0·455	17·5 / 21	1·80	39·20
2	Cr-Al-Fe ..	0·455	17·5 / 21	1·80	39·95
3	Ni-Cr (U.S.) ..	0·455	13·5 / 16·2	1·25	41·80
4	Cr-Al-Fe ..	0·400	26 / 31·2	2·00	38·40
5	Cr-Al-Fe ..	0·400	26 / 31·2	2·00	38·75
6	Ni-Cr (U.S.) ..	0·455	13·5 / 16·2	1·25	42·60

determining the value of the insulation impedance for the same samples (units Nos. 2 and 3) with constant energy consumption. The fall of insulation resistance of the chromium-aluminium-iron unit was less than for the other (Fig. 5) and at the outset started to rise again after a time, ultimately exceeding its initial value. The falling characteristic is attributed to changes in volume in each instance during the early stages, probably with diffusion of particles of metal or metal oxide from the surface of the wire into the insulating powder. After a period, however, a firmly adhering protective layer of aluminium oxide is increasingly formed on the surface of the chromium-aluminium-iron wire. At 1,500 W the reversal is less marked, probably because the reduction in cross-sectional area raises the temperature enough to cause an increase of leakage current that affects the protection given by the aluminium oxide layer. With No. 3 unit, however, nickel and chromium oxides are diffused in an almost uniform flow into the powder, causing a gradual lowering of its insulating properties.

Regarding the life tests units Nos. 1 and 2 (chromium-aluminium-iron) attained the highest figures, although their surface loading was 30 per cent greater than that of unit No. 3 (nickel-chromium) which however had a 21 per cent shorter life. The figures reached by units Nos. 4 and 5 are nearly the same as for unit No. 3, indicating that they would stand a surface loading up to 100 per cent higher. This is more than would be advisable on grounds of reliability and manufacturing tolerances, but a surface loading of 17·5 W/cm² (1 W/cm² equals 6·45 W/sq in) for a chromium-aluminium-iron heater should be acceptable in practice.

Hours on load of the test units, up to the appearance of faults, were as follows:—

Unit No. 1.—After 10,660 hours on test (5,330 hours on load) a longitudinal crack occurred in the tubular member, but the chromium-aluminium-iron heater had not burnt out (surface loading of the heater during the first 1,900 hours on load was 17·5 W/cm², then 21 W/cm²).

Unit No. 2.—After 10,690 hours on test (5,345 hours on load) the chromium-aluminium-iron heater burnt out (surface loading of the heater during the first 1,900 hours on load was 17·5 W/cm², then 21 W/cm²).

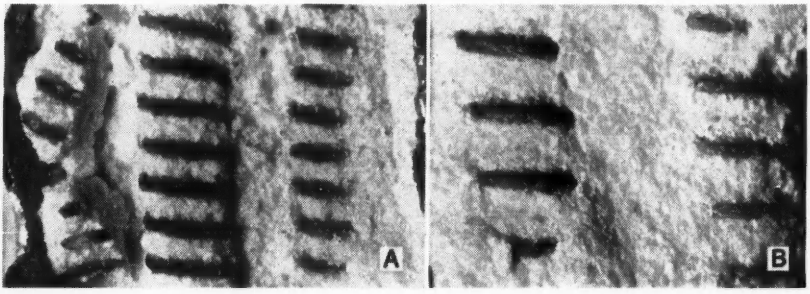
Unit No. 3.—After 8,430 hours on test (4,215 hours on load) the nickel-chromium heater burnt out (surface loading of the nickel-chromium heater during the first 3,800 hours on test was 13·5 W/cm², then 16·2 W/cm²).

Unit No. 4.—After 8,300 hours on test (4,150 hours on load) the chromium-aluminium-iron heater burnt out (surface loading of the chromium-aluminium-iron heater during the first 1,900 hours on load was 26 W/cm², then 31 W/cm²).

Unit No. 5.—After 9,040 hours on test (4,520 hours on load) the chromium-aluminium-iron heater burnt out (surface loading of the chromium-aluminium-iron heater during the first 1,900 hours on load was 26 W/cm², then 31 W/cm²).

The unit No. 6, referred to in Table 1, was put into operation (in place of a unit also fitted with a nickel-chromium heater, which had burnt out after only 2,000 hours on load) considerably later than the other test units. At the time of writing this

Fig. 6.—Macrophotographs of resistor wires in units Nos. 3 and 2 after removing insulating powder



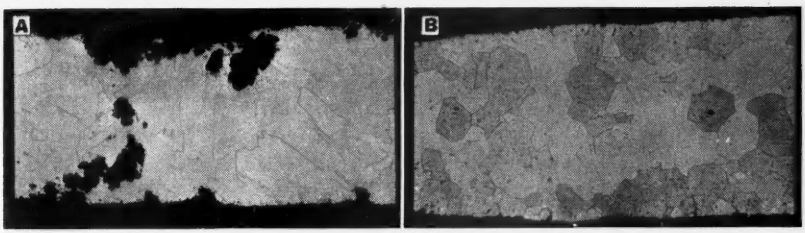


Fig. 7.—Lengthwise sections through resistor wires after the long duration test, 100 magnification

report it had survived 1,000 hours on load. The macrophotographs (Fig. 6) of the resistor wires after removing the insulating powder indicate that the powder near the nickel-chromium wire of (A) No. 3 unit is discoloured by diffusion of nickel and chromium oxides while the surroundings of the chromium-aluminium-iron wire (B) of No. 2 unit are not attacked. The magnified lengthwise sections (Fig. 7) through the wires after long duration tests show that (A) is heavily attacked on the surface by oxidation while the (B) surface is only a little oxidized and retains aluminium in the alloy.

For simplicity the effects of materials used for metal sheathing, insulating media and constructional shapes have not been considered. In present manufacturing technique, however, certain constructional features predominate and it is held that the greatest interest therefore attaches to the materials used for the heater and its most suitable dimensions.

Electricity in France

From Our Paris Correspondent

THE report issued by Electricité de France for 1950 shows that electricity consumption reached 33,390 million kWh, the highest annual total yet recorded in France. This included 16,250 million kWh from hydro-electric power stations, 16,953 million kWh thermal production, and 249 million kWh representing the balance of exterior exchanges. Compared with 1949, consumption increased by 8 per cent, partly because of the relaxation of restrictions. New supplies of over 100 kW still require authorization, and rationing of consumption by those with over 1,000 kW remains in force.

An improvement in hydro-electric production was noted in 1950 as well as a more regular distribution between the three main production regions, and the output of hydro-electric plants increased by about 1,000 million kWh as compared with 1949. By the end of the year total installed power was 6,100,000 kVA. Maximum possible power of thermal plants increased by over 400,000 kW to 4,245,000 kW in 1950, and the mines brought 160,000 kW into service in 1950.

Effective hydro-electric production by E.D.F. plants in 1950 amounted to 12,646 million kWh, an increase of 47 per cent over the preceding year. Installed power also showed an increase, amounting to 5,074,000 kVA in 1950, compared with 4,666,000 kVA in 1949, representing a 9 per cent increase. During 1950, ten new plants came into service. Because 1950 was a good hydro-electric year thermal plants were not required to make up deficiencies as in 1949. Thermal production was therefore lower than in 1949 but still showed progress. Average consumption of fuel per kWh showed a 6 per cent improvement compared with 1949.

The year was also characterized by an increase in power transmission equipment. In 1950, 5,809 km of 225 kV cable was available against 5,232 km in 1949; 8,717 km of 150 kV cable against 7,943 km; and 720 km of 110–120 kV against 760 km. Regional power transmission centres spent 2,000 million fr in 1950 on complementary equipment work and 1,400 million for renewals and maintenance.

Supplies to E.D.F. by Switzerland during 1950 amounted to 180 million kWh and new agreements have been signed. The balance for the year showed net imports amounting to 268 million kWh. Imports and exports with Belgium balanced, and amounted to 9·4 million kWh. Supplies from Italy amounted to 79 million kWh, but exports by E.D.F. exceeded this by 98 million kWh. Imports from Germany showed a net excess of 14 million kWh.

A.S.E.E. Presidential Address

Improving Electricity Supply

IN his second-term presidential address to the Association of Supervising Electrical Engineers on 16th October, Mr. T. G. N. Haldane discussed the questions raised by the increasing electrification of this country. In the United States, he said, generating capacity was now being increased by 7,000 MW annually compared with the 1,000 MW installed here in 1950 and the ultimate target of 1,800 MW. Allowing for a three-to-one population ratio, only by installing more than 2,000 MW annually could we keep pace with the United States, where 11,700 kWh per operative worker was consumed in 1949 compared with 3,200 kWh here.

While the speeding up of generating plant installation was the primary consideration (hydro-electric stations in the United States were normally completed in 2½ years), recent developments in transmission at very high voltages would bring increasing advantages. Stability difficulties had been largely obviated by the use of series capacitors, shunt reactors and high-speed switching. The corona problem would probably be overcome by means of multiple or bundled conductors, i.e., two or more conductors per phase connected in parallel and spaced 12in apart. Multiple conductors, having a lower reactance, increased stability and hence the amount of power they could transmit.

Higher Transmission Voltages

The two outstanding transmission systems were the Boulder Dam—Los Angeles 287 kV line which carried 250 MW over 270 miles and the Swedish 380 kV line (under construction) with a carrying capacity of 300 MW over 600 miles. Probably 400 kV would meet requirements anywhere during the next ten to twenty years; subsequently 500 kV would be reached, enabling 250 MW to be transmitted nearly 1,000 miles or larger amounts for shorter distances. Research into d.c. transmission, he hoped, would be especially directed towards linking the grid with the mixed thermal and water power system of the Continent.

Each circuit of the British 275–300 kV grid, now under construction, would carry 350 or 550 MW, depending on conductor size, and some of the lines, particularly near London, would be designed for eventual operation at 380–400 kV. The system when complete would be by far the largest fully interconnecting high-voltage network in the world. It would, he believed, relieve load shedding more than would generating plant of similar cost (which it would supplement and not supersede) and its effect, through diversity of several kinds, would be equivalent to over 5 per cent of the peak load. Pumped storage stations might also be used to relieve the peaks, water being pumped up to a high-head reservoir at night and released through turbines as required during the day. Probably at least £50/kW could economically be spent on pumped storage plants, including transmission.

Fuel Resources

Mr. Haldane had little doubt that the demand for coal would exceed the estimates for 1961–1965 of the National Coal Board (210 million tons for home consumption and 30 million tons for export). The consumption for electricity generation he believed would be 20 to 30 per cent higher than the 45 million tons allowed for. On an optimistic estimate, water, tidal and wind power could not be expected to provide more than 10,000 million kWh annually in ten years time—half the amount needed —so that coal deficiency would then reach ten million tons. In considering the economics of possible coal saving developments, it should be assumed that the coal otherwise required would be imported at much higher prices than home-produced coal. Nuclear fission could not be counted on within the next ten years. There would be more hope of saving ten million tons of coal annually through railway electrification. Better use of very low-grade fuel by the mining industry was another way of saving coal.

Mr. Haldane concluded his address with a reminder that human problems were more complex than technical ones.

VIEWS on the NEWS

By REFLECTOR

IT is 76 years since the cable ship *Faraday* was launched and 28 years since she was "retired" and now she is in the shipbreakers' hands. The *Faraday* was built for Siemens Bros. & Co. to the design of the late Sir William Siemens. She has a displacement of 5,000 tons and a length of 360ft with three large cable tanks and handling gear. During the almost half a century in which she was in service the *Faraday* laid over 50,000 miles of submarine cable, including eight cables across the Atlantic. Thus she did a great deal to link together the nations of the world and merits a thought on her passing.

* * *

A correspondent to the October *Bulletin* of the Radio Society of Great Britain, recalling the early days of wireless transmission, says that when, in 1897, Marconi's diagram of the original coherer was published in the *Electrical Review* he and a friend decided to make one. It consisted of two silver pistons inserted in a short length of glass tube taken from a baby's feeding bottle. The pistons, which were separated by nickel filings with a trace of mercury added, were connected through a battery to an ordinary electric bell. Then, using a "transmitter" comprising a coil capable of giving a one-inch spark, they "did some excellent DX work from an upstairs room to the kitchen." The writer asks if this is a record in experimental radio work of an amateur nature.

* * *

It is necessary for the public to be warned to use their electrical appliances carefully and to see that their installations are in order, but care should be taken by those who give the warnings not to imply that electrical appliances are lethal weapons. Fire officers are particularly prone to this and it is also frequently their habit to attribute to electricity fires in which no definite cause is ascertainable. Nevertheless their advice and suggestions are sometimes very sound, as for instance when Chief Fire Officer B. W. R. Smith, of Nottingham, gives it as his opinion that no heating appliance should be allowed on the market until it has been certified by a competent body to be safe. This would eliminate some of the flimsy and dangerous types of heaters which are still offered for sale.

* * *

Last week I referred to a letter in the *Sunday Express* purporting to have been written by Mr. E. L. Morland who has just retired from the service of the Merseyside and North Wales Electricity Board. This letter has been described by Mr. Morland's solicitors as a pure fabrication; it was not written by him or on his authority. The *Sunday Express* has apologized to Mr. Morland, and I, too, sincerely regret that I gave further publicity to the forgery by quoting it.

* * *

Having spent quite a while last week-end tracing a fault in my house wiring installation I have come to the conclusion that it is high time that electrical contractors adopted the practice of providing as part of their service a diagram showing the route of the wiring. Faults, though rare, are bound to occur sometimes and even in apparently straightforward installations the looping arrangements are not always obvious. Much dismantling of switches, etc., would be obviated if one knew in advance which way the wiring went. I wonder, too, how many houses, the older ones anyhow, even have their fuses marked to indicate the rooms covered. This is a simple enough job for the contractor but one which is unlikely to be done by the householder, who unless he has a particularly good memory may have to inspect a dozen or so fuse carriers before he finds the right one.

PERSONAL and SOCIAL

News of Men and Women of the Industry

THE British Electricity Authority has appointed **Mr. B. Sidebottom** power station superintendent at the new Plymouth "B" station of the South Western Division. Mr. Sidebottom is at present deputy power station superintendent at Meaford generating station, and he will be taking up his new duties as soon as he can be released by the Midlands Division from his present appointment.

Electric & Musical Industries, Ltd., has announced the appointment of **Mr. P. P. Vernon** as managing director of E. M. I. Suppliers, Ltd. In his new appointment Mr. Vernon will be responsible for all the purchasing activities of the E. M. I. group of companies. He has been associated with E. M. I. without a break since 1923. At the outbreak of war he was appointed assistant purchasing controller, and was responsible for the purchasing and maintenance of supplies needed for the special armament work on which the whole of the E. M. I. factories were engaged. Mr. Vernon became a director of E. M. I. Suppliers, Ltd., when this company was formed by Sir Ernest Fisk in 1946.

Mr. P. P. Vernon

Miss H. M. Maurice of the Wolf Safety Lamp Co. (Wm. Maurice), Ltd., has succeeded her father, the late Mr. William Maurice, as governing director of the company.

Mr. A. Shaw has joined London Electrical Co. (Blackfriars), Ltd., and has been appointed assistant sales manager. He was previously sales engineer with Siemens Electric Lamps & Supplies, Ltd.

Mr. E. B. M. Grubb has been appointed general manager of D. H. Bonnella & Son, Ltd., upon relinquishing his appointment as sales director of London Electrical Co. (Blackfriars), Ltd.

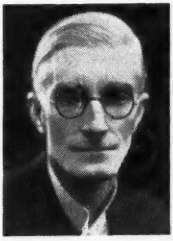
The sixth annual dinner and smoking concert of **Johnson & Phillips' Foremen's Association** was held on 12th October at the McLeod Restaurant, Woolwich, 160 members and guests attending.

Mr. G. L. Wates (chairman of the company) presided and among the guests were Mr. W. Glass (joint managing director), Mr. R. W. C. Reeves (director of Johnson & Phillips), Mr. J. N. Dean (chairman, Telegraph Construction & Maintenance Co., Ltd.), Dr. E. W. Smith (director, Submarine Cables Ltd.), Mr. B. Musgrave and Dr. G. A. V. Sowter (directors, T. C. & M.). Also present were members of the T. C. & M. Foremen's Association. A toast to the company was proposed by Mr. S. A. Simmons, chairman of the Association, to which Mr. Wates replied.

The toast of the Association was proposed by Mr. P. M. Hollingsworth (manager, Paper Cable Test and Research Department), Mr. Crichton responding. Mr. J. A. Hayward, in a toast, welcomed the guests, Dr. Sowter replying. An excellent concert concluded a successful evening.

At their meeting in the first round of the C.M.A. Cup **Johnson & Phillips, Ltd.**, beat Southern United (Dagenham Cables) by one goal to nil. After the match the teams had tea at Victoria Works Sports Club where they were welcomed by Mr. Whitehead, assistant general manager, Johnson & Phillips. A concert and dance were held in the evening.

Mr. G. F. Shotter, M.I.E.E., meter testing laboratories superintendent of the Northmet Sub-Area, Eastern Electricity Board, retired on 15th September after nearly half a century in the electricity supply industry. Mr. Shotter received his electrical training at the South Western Polytechnic, and after a period with the Corporation of London Electricity Department, joined the Northmet Power Co. at Willesden power station in 1906, and later was transferred to Friern Barnet where he was in charge of the Northmet Co.'s meter department. On nationalization he was appointed meter testing laboratories superintendent to the Eastern Board.



Mr. G. F. Shotter

Mr. Shotter is a recognized authority in the field of instrument technology and has to his credit nearly 100 patents of many types of electrical and mechanical instruments. He was a

founder member, and was first president, of the Meter Engineers' Technical Association, which was later absorbed by the Institution of Electrical Engineers, and he was chairman of the Meter and Instrument Section (now Measurements Section) of the Institution in 1936-37. He has read many papers before the I.E.E. and has been awarded the John Hopkinson, the Kelvin and other premiums. He was also awarded the New Zealand Government's Centenary medal for his researches on earthing problems. He has served on several B.S.I., E.R.A., and other technical committees. Mr. Shotter does not propose to give up his technical pursuits and hopes to carry on with his consulting activities and a certain amount of committee work.

Major S. J. J. Vaughton, M.C., T.D., has been appointed assistant managing director of Higgs Motors, Ltd. Major Vaughton was educated at King Edward's School, Birmingham, and during twenty-six years' service with Higgs Motors has been sales engineer, sales manager and director. He served with the Royal Tank Corps in the 1914-18 war and was with the Royal Warwickshire Regiment from 1939 to 1945.

Major S. J. J. Vaughton

The **British Thomson-Houston (Willesden) Social and Athletic Club** celebrated its silver jubilee at Wembley Town Hall on 18th October. Well over 450 people attended and among the many guests were Mr. E. H. Ball, managing director of the B.T.H. Co., who spoke of the past history of the Club and wished members further progress during the next twenty-five years. Mr. H. E. Cox, manager of the B.T.H. Willesden works, accompanied by Mrs. Cox and Alderman C. J. Life and Mrs. Life (Mayor and Mayoress of Wembley) were also present. Mrs. Life and Mrs. Cox presented the prizes which included a Hotpoint vacuum cleaner, iron and toaster. A cabaret followed and dancing was to the music of Sydney Jerome's Television and Broadcasting Orchestra.

The annual dance and carnival of the Birmingham Branch of the **Electrical Industries Benevolent Association** was held at the Magnet Club, G.E.C. Works, Witton, on 12th October, and was a most successful evening. Some 500 or more people attended and dancing and side shows continued until 1 a.m. The prizes were distributed by Mrs. F. W. Lawton. It is hoped that as a result of this effort a substantial sum will once again be handed to the E.I.B.A. funds.

For its autumn production the **G.E.C. Dramatic Society** presented "The Hasty Heart," by John Patrick at the Fortune Theatre, London, on Thursday and Friday last week. This is a play which demands team work from the whole of the cast, and the players succeeded in giving a well-balanced performance. The action of the play takes place in a convalescent ward of a British hospital within the South East Asia Command. Mr. Ian Stewart as "Lachlan," the Scottish soldier embittered by his struggle to establish a place for himself in society, and who ultimately finds his true self, gave a moving performance, and Mr. Michael Molloy as the "Yank" was excellent. A special word of praise is also due to Mr. Benny Nightingale, who as "Blossom," the coloured inmate of the ward, had a silent part, but nevertheless gave it personality, while Messrs. Gordon Singleton, John Hanhart and Frederick James, as the remaining inmates, gave strong support. Miss Joan Middleton as the sister of the ward, played the part with sympathy and charm, and Millar Dixon, the medical officer and Keith Clifton, the orderly, were also efficient. A full house on each night gave the production an enthusiastic reception.

Mr. C. Lacy-Hulbert has resigned his position as technical director of the Simplex Electric Co., Ltd. Except for a period of six years as works director of Tubes, Ltd. Mr. Lacy-Hulbert has been associated with the electrical division of Tube Investments, Ltd., since 1930. He has now taken up the appointment of managing director of Craig & Derricott, Ltd., of Sutton Coldfield.

Mr. C. Lacy-Hulbert

Nearly 500 employees of **A. Reyrolle & Co., Ltd.,** with twenty-five or more years' service with the company were entertained to dinner by the directors on 10th October, at the Old Assembly Rooms, Newcastle-on-Tyne. The guests were greeted by Sir Claude D. Gibb, C.B.E., D.Sc., F.R.S. (chairman), who afterwards presented gold wristlet watches to thirty-eight members of the company who had completed over forty years' service. Mr. L. Mellor, M.B.E., J.P., one of the recipients, responded for the guests, and also thanked Sir Claude on behalf of all those who had been given watches. A pleasant evening was suitably rounded off with an entertainment by Mr. Fred Lawson and Bernadi (members of Reyrolle staff), Miss Rosamond Turnbull, and Miss Elsie Musgrave, who is accompanist to the Reyrolle Musical Society.

Over 200 members and their guests attended the annual ladies' night of the **Electrical Trades Commercial Travellers' Association** at the Café Royal, London, W.1, on 5th October. Mr. L. A. Fickling, chairman, presided, and with him were his wife and daughter and Mr. H. A. Deacon, president, and Mrs. Deacon. After dinner Mr. Deacon acknowledged a toast proposed by Mr. S. W. Graefe. Mrs. Fickling replied to the toast to the ladies given by Mr. A. C. Burbidge. The immediate past chairman, Mr. C. L. Elvy, proposed the toast of the chairman, and Mr. Fickling responded. During the evening there was a cabaret and dancing.

OBITUARY

Mr. W. B. Parker.—The death occurred on 12th October at the age of seventy-seven of Mr. William Bayley Parker, who had retired from the British Thomson-Houston Co., Ltd., in 1946, after forty-four years' service. Mr. Parker was the company's chief chemist and metallurgist from 1902 until 1943, when he was appointed consultant chemist and metallurgist to the company. Acting for B.T.H., he was one of the first councillors of the founders of the British Cast Iron Research Association, and was an active member of many of the committees of the British Standards Institution and of the British Electrical and Allied Industries Research Association (E.R.A.). In connection with these committees, and particularly the latter, he conducted numerous researches on insulating oils, and lubricating oils, shellac, mica, and many metallic substances, etc.

Mr. Herbert Coope, M.I.E.E., district manager, Cardiff, of the Metropolitan-Vickers Electrical Co., Ltd., died on 20th October at Penarth, Glamorgan at the age of sixty-four. Mr. Coope was apprenticed to the British Westinghouse Electrical & Manufacturing Co., Ltd., Trafford Park, Manchester, on completion of which he was with the London Erection Department of the company. In 1919, when the company became the Metropolitan - Vickers Electrical Co., Ltd., he joined the commercial staff at Manchester district office and since 1922 had been district manager for the company for South Wales and West of England. Mr. Coope was chairman of the Western Centre of the I.E.E. for 1943-44, and was a vice-president of the South Wales Institute of Engineers.

The late Mr. H. Coope

Mr. T. C. Irving.—The death occurred on 3rd October of Mr. T. Caven Irving, B.Sc., A.M.I.E.E., who was until very recently the representative in Spain and Portugal of the Metropolitan - Vickers Electrical Export Co., Ltd. Mr. Irving was to have played an important part in the company's South American activities, and it was during a preliminary visit to Brazil that his health broke down. He returned to this country and died suddenly after an operation. He received his technical education at Edinburgh University, and went to M-V as a college apprentice in 1925. After a short period in the Plant Sales Department he joined the Export Company, and went to Spain at the end of 1927, spending three years in Madrid and then moving to Bilbao. In 1937 he became the company's representative in Spain and Portugal.

The late Mr. T. C. Irving

WILLS

Mr. F. W. Coomber, of Worcester, who was concerned with the development by Mackenzie & Holland, Ltd., of the Sykes electrical lock and block railway signalling apparatus, left £12,938 gross (£12,845 net).

Mr. A. J. Leyland, B.Sc.(Tech.), M.I.E.E., joint general manager of Automatic Telephone & Electric Co., Ltd., and a director of British Telecommunications Research, Ltd., who died on 26th February last, left £19,039 gross (£18,435 net).

Mr. G. T. Frost, M.I.E.E., London sales manager of Chamberlain & Hookham, Ltd., who died on 12th April last, left £2,802 gross (£2,680 net).

Mr. E. A. Guthrie, manager of the American Division of the Metropolitan-Vickers Electrical Export Co., Ltd., who died on 12th June last, left £9,318 gross (£6,945 net).

Mr. H. A. Sieveking, M.Sc.(Eng.), M.Inst.C.E., M.I.E.E., of Ealing, W, a hydro-electric specialist engineer with the English Electric Co., and lecturer on hydraulic turbine design at the Imperial College of Science and Technology, who died on 20th June last, intestate, left £9,376 gross (£6,749 net).

Mr. E. A. B. Chrich, senior section head (operation and maintenance) in the Chief Engineer's Department, East Midlands Electricity Board, who died on 14th March last, left £4,950 gross (£4,855 net).

Radio Power Cut Warnings

THE British Electricity Authority has completed arrangements with the B.B.C. for broadcasting warnings of impending power cuts. Starting on Monday next, these warnings will be broadcast in the Light Programme on the 1,500-metre wavelength at any time between 7.30 and 12.30 in the morning and 3 to 6 p.m., from Monday to Friday.

Warnings can be issued only after a decision to shed load has been taken at the National Control Centre. The warning messages will be sent by teleprinter to Broadcasting House from the National Control Centre and will be broadcast immediately. The country has been divided into a number of load shedding areas, designated by numbers, and the extent of the shedding will be indicated by numbered 5 per cent stages. Important industrial consumers, for whom the warnings are primarily intended will be notified by the Electricity Boards of their area numbers and of the details of their shedding rotas so that they will be able to recognize any warnings which apply to them. Other consumers who require warning can obtain details from their Area Boards.

A typical broadcast warning will take the form : " Load shedding is about to take place in Area 2, Stage 4, and in Area 4, Stage 3." Since the first two stages of load shedding do not normally involve disconnection of supply, this will mean power cuts of 10 per cent in Area 2 and 5 per cent in Area 4. There may be emergencies when power cuts will have to be made with such urgency that no warning will be possible. On some occasions it may be impossible for technical reasons to carry out load shedding in small sections of areas for which warnings have been issued.

New Cinema Technique

AT the Dorchester Hotel, London, W., on Monday last Mr. Norman Collins, chairman and managing director of High Definition Films, Ltd., explained his company's scheme for the development of the use of electronic equipment in the film industry. He was accompanied by other directors of the company, including Mr. C. O. Stanley, chairman of Pye, Ltd., which is associated with the new development, and Mr. T. C. Macnamara, technical director of Scophony Baird, Ltd. The J. Arthur Rank Organization is also concerned with the new company.

It was explained that with the electronic camera, the director and others during rehearsal and actual " shooting " see the picture on a television screen exactly as it will be when it is recorded. All cuts, fades, mixes, wipes, opticals, etc., are under the personal control of the director and a portion of the complete finished film, in place merely of disconnected shots, is immediately available to him after any day's shooting. The electronic camera is not only more sensitive than the current optical film camera, but the electronic system is directly applicable to colour, process shots, e.g., artificial scenery, and to stereoscopy. Further experiments are being conducted in these various fields.

Already the latest electronic camera developed in the Pye laboratories, Cambridge, shows that a degree of definition can be obtained equal to that of the normal optical camera at present employed in film studios, and recent experiments in recording the electronic picture have shown that there need be no loss of definition in recording on celluloid for normal projection to cinema audiences. The first film demonstrating the new method will be produced by High Definition Films, Ltd., during the coming year.

Technical Colleges

THE work of technical colleges was reviewed, from the electrical engineering point of view, by Dr. E. C. Walton (Leeds College of Technology) in the address he delivered as the new chairman of the North Midland Centre of the Institution of Electrical Engineers.

The subject was introduced by reference to the varied educational levels of students entering upon electrical engineering courses in such colleges. The numbers of the latter which offered such facilities were 160 in England and Wales, twelve in Scotland and eight in Northern Ireland, including full-time and part-time courses and those leading to the award of Ordinary and Higher National Certificates and Diplomas, external and internal degrees, and City & Guilds qualifications. It was pointed out that there were not at present any recognized courses or qualifications for craft apprentices engaged as electrical fitters in the electricity supply industry.

Turning to degree and post-graduate courses, reference was made to the arrangements whereby students in certain affiliated colleges were eligible for the award of internal degrees. Both full-time and part-time courses for the external degree in engineering of the University of London were described and a brief mention was made of certain specialized higher technological courses of post-graduate level, the need for which had been emphasized at a conference arranged by the I.E.E. in March, 1950.

In the concluding section of his address Dr. Walton referred very briefly to post-war discussions relating to higher technological education and in particular to the " Percy " and " Weeks " reports and the recent Government White Paper. He stated that, in his opinion, the satisfactory development of such higher technological courses would be dependent on the provision of a generous scale of financial assistance for the technical colleges concerned.

Trunk Radio Systems

Their Design and Operation

SOME of the factors involved in the design and operation of trunk radio systems were discussed in detail last week by Dr. D. C. Espley (G.E.C. Research Laboratories) in his inaugural address as chairman of the Radio Section of the Institution of Electrical Engineers. Dr. Espley began by considering the role of directive radio links in extensive networks and said that most of the traffic which such links might be expected to convey could be carried by cable systems. In view of this, the address was mainly an attempt to decide in which way cable systems were inappropriate to deal with the traffic planned for, say, the next 20 years and what were the special qualities of radio networks which could be expected to provide better facilities as alternatives or additions to cable networks.

Dr. Espley touched on certain practical aspects of techniques in dealing with these questions and also placed some emphasis on what he called the " philosophy " of the subject. He thought it unwise, however, to consider radio trunks as detached networks as the need could be seen for overall systems of a national or international character in which radio links would be merged with cable and line networks on a permanent or switched basis.

Radio Repeaters

In considering the radio channel Dr. Espley explained why radio repeaters did not present the same " universal " features of a coaxial-cable repeater and how, because they were not amenable to feedback treatment, two styles of radio repeater had appeared. However, he suggested that the use of radio-multiplex was analogous to the technique of composite cables, in which, within one duct and one sheath, a number of balanced pairs and coaxial tubes could be physically associated, but without the need for common repeater or terminal equipments. In cases of bandwidth shortage, for example, a television signal might be transmitted over a radio-multiplex link in which the code pulses were distributed between two or more channels each of restricted bandwidth. In view of the bandwidth obtainable with modern aerial systems there would be an increasing use of common-aerial and filter arrangements for simultaneous transmission and reception.

Dealing with the problem of frequency he said that increase of operating frequency was not a panacea; there was little justification for neglecting the lower part of the spectrum. It might be feasible to increase the usage of a given band by the allocation of the same frequency to many stations, with the use of highly directional beams and as a result of the severe wave attenuation beyond the horizon. It would be unwise to say that an effective choice of frequency could be found from consideration of international allocations and propagation conditions alone. The availability of special valves, particularly in the u.h.f. range, was likely to be a dominant factor for some time.

Aerial Design

Turning to aerials, Dr. Espley thought the position a little curious as, although an immense amount of theoretical and experimental work had been carried out, every project in this field seemed to require a significant amount of development work. However, in the v.h.f. range the choice usually remained between broadside arrays and Yagi aerials, while in the u.h.f. range most aerial systems used paraboloidal reflecting surfaces, and variants of this type were likely to remain in spite of other recent developments. Much of the work was devoted to the engineering details of particular aerials, screens and mountings.

Although many factors were involved in the operation of radio trunk repeaters one of the biggest problems was that of remote-station power supplies. The chairman concluded by expressing the opinion that if the potentialities of pulse-code modulation and very large bandwidths were fully taken into account it was likely that the radio link could be designed to compare favourably with a cable network.

OVERSEAS ELECTRICAL TRADE

Reduction in Exports in September

ALTHOUGH the total exports of electrical apparatus and machinery declined from £15,041,393 in August to £13,835,566 last month, in which there was one working day fewer, the latter figure is still £3,442,454 above that for September last year. These totals do not take into consideration the many classifications of equipment which are largely but not exclusively electrically operated, among which may be mentioned (with the September, 1950, figures in parentheses) mechanical handling equipment £943,465 (£748,742), metal working machine tools other than portable types £1,370,240 (£1,283,823), pumps £753,314 (£684,867) and refrigerating machinery £1,147,036 (£737,116). Reference to Table I reveals

TABLE I.—ELECTRICAL EXPORTS

Class	September, 1951	September, 1950
	£	£
Telegraph and telephone cables and wires (submarine)	—	44,583
Ditto, not submarine	336,842	462,944
Wires and cables, paper insulated	568,474	472,541
Ditto, rubber insulated	556,557	354,677
Ditto, cotton, silk or artificial silk insulated	52,852	43,715
Ditto, enamel, glass or asbestos insulated	57,827	52,890
Ditto, other	205,922	116,838
Commercial radio apparatus	453,550	896,940
Domestic radio apparatus	402,477	225,775
Telegraph, telephone and signalling apparatus	1,324,295	1,229,098
Radio loudspeakers	53,906	36,065
Telecommunication components, n.e.s.	500,363	318,457
Other telecommunication apparatus	134,407	67,182
Valves and cathode ray tubes	308,768	188,051
Carbons	26,594	30,126
Lamps, exceeding 24 V	103,484	71,988
Ditto, not exceeding 24 V	47,485	27,401
Other lighting appliances	397,652	262,496
Primary batteries	209,243	12,,549
Parts other than carbons	31,997	15,847
Accumulators for motor vehicles	347,355	149,737
Ditto, traction	43,851	17,511
Ditto, radio	3,210	2,555
Other portable accumulators	70, 53	81,463
All other accumulators	70,421	61,847
Parts and accessories	93,639	55,753
Cooking appliances	213,870	99,193
Heating appliances	84,980	45,348
Parts and accessories for cooking and heating appliances	69,378	52,353
Flat irons	81,295	48,064
Commercial electrical instruments	98,558	90,776
House service meters	134,843	102,569
Time recorders and time switches	27,300	18,198
Other electrical instruments	88,805	103,667
Electro-medical apparatus (not X-ray)	46,693	44,003
X-ray apparatus, tubes and parts	127,270	84,201
Permanent magnets	20,901	19,955
Insulating cloth and tape	114,633	56,334
Other insulating materials	87,447	69,642
Unclassified electrical goods and apparatus	167,334	115,274
TOTAL electrical goods and apparatus	8,064,531	6,660,606
Diesel driven generators not exceeding 200 kW*	334,182	323,907
Ditto, exceeding 200 kW*	81,849	130,401
Other generating sets*	423,790	331,370
Generators exported without prime movers, and parts of generators†	429,992	115,077
Motors, railway, tramway and trolley bus	—	22,234
Ditto, other, not over ½ h.p.	104,881	78,750
Ditto, over ½ h.p. but under 1 h.p.	76,429	30,050
Ditto, from 1 h.p. to 250 h.p.	452,573	332,011
Ditto, exceeding 250 h.p.	64,604	99,122
Ditto, parts	80,619	51,513
Converting machinery	8,140	6,676
Transformers, including coils	632,935	567,001
Rectifiers for power house use	16,785	30,821
Motor starting and controlling gear	186,451	194,462
Switchgear and switchboards (not telegraph and telephone)	1,097,786	699,979
TOTAL electrical machinery	3,991,016	3,013,374
Washing machines (not exceeding 250 lb weight)	722,204	292,438
Ditto, parts	30,276	9,116
Vacuum cleaners	378,952	182,394
Ditto, parts	28,821	29,975
Other electrically operated portable appliances and parts	289,129	85,935
Portable electric tools	84,730	71,264
Unspecified electrical machines, machinery and parts	245,907	48,010
GRAND TOTAL	13,835,566	10,393,112

* The 1950 figures include generators without prime movers

† The 1950 figures are for parts of generators only

improved trade in practically every section of the industry compared with the corresponding month of last year, a notable exception being commercial radio apparatus shipments of which declined from £896,940 to £453,550. The total value of items classified under the heading "electrical goods and apparatus" rose from £6,660,606 to £8,064,531 of which Australia took £1,188,781 (£912,675) worth, South Africa £704,293 (£522,775) and India £681,085 (£489,973). Although trade with the United States was very slightly lower (£93,893 compared with £95,903), Canada helped the dollar situation by increasing its purchases from £408,578 to £466,337. The distribution of the exports to other countries is given in Table II.

TABLE II.—Distribution of Electrical Goods and Apparatus

Destination	September, 1951	September, 1950
	£	£
Channel Islands	43,252	35,689
Gibraltar	6,936	4,212
Malta and Gozo	9,576	7,816
Cyprus	21,991	14,966
British West Africa	88,413	150,906
Union of South Africa	704,293	522,775
Northern Rhodesia	31,233	29,329
Southern Rhodesia	145,220	55,957
British East Africa	213,378	150,876
Bahrein, Kuwait, Qatar and Trucial Oman	60,726	14,514
India	681,085	489,973
Pakistan	184,619	195,618
Malaya	476,854	146,080
Ceylon	116,556	47,720
Hong Kong	162,453	97,800
Australia	1,188,781	912,675
New Zealand	466,337	408,578
Canada	156,348	123,176
British West Indies	90,393	110,095
Anglo-Egyptian Sudan	37,237	48,286
Other Commonwealth Countries	57,136	59,838
Irish Republic	275,392	322,002
Soviet Union	10,583	14,410
Finland	69,918	25,015
Sweden	240,774	105,157
Norway	151,543	112,076
Iceland	18,424	9,515
Denmark	80,587	74,325
Poland	15,378	30,527
Germany	22,288	27,226
Netherlands	189,200	206,251
Belgium	90,044	502,104
France	73,937	91,370
Switzerland	18,023	45,229
Portugal	58,757	111,951
Spain	69,652	11,043
Italy	81,361	43,603
Austria	13,160	23,373
Hungary	7,034	12,915
Czechoslovakia	7,916	13,713
Greece	36,121	131,405
Turkey	68,567	119,082
Indonesia	7,524	11,155
Portuguese East Africa	27,769	5,347
Syria	20,877	17,498
Lebanon	32,232	24,416
Israel	29,394	27,289
Egypt	191,544	199,132
Arabia	13,505	17,194
Iraq	116,015	10,152
Iran	49,156	58,630
Burma	32,282	5,388
Thailand	53,444	18,990
China	2,732	1,787
United States of America	93,893	95,903
Colombia	4,278	7,099
Venezuela	21,443	25,602
Peru	26,159	59,437
Chile	11,395	24,872
Brazil	213,504	125,206
Uruguay	30,476	15,883
Argentine Republic	283,011	165,789
Other Foreign Countries	232,422	84,566
Total	8,064,531	6,660,606

Canada also accounted for £140,476 of the £1,269,813 worth of generating plant exported and was second only to Australia (£166,718) in order of importance in this market. It is a sign of the times that Russia, for many years the largest buyer in this classification, was sent no generating equipment whatsoever last month: in September, 1950, plant valued at £186,497 was dispatched.

Australia was the biggest buyer of motors, increasing its purchases from £67,509 to £183,749, but with £344,593 was second to South Africa (£393,844) in the list of countries to which shipments of other electrical machinery were made.

Imports of both electrical apparatus and machinery show a tendency to increase, the total rising from £484,982 in September, 1950, to £670,891 last month. Of the £586,101 (£425,275) worth of electrical goods and apparatus Holland supplied nearly half (£204,367). The principal items were radio apparatus (£151,714), valves (£133,017) and lighting equipment (£68,738). The £84,790 worth of electrical machinery received included generators (£14,538), motors (£35,595) and "all other sorts" (£34,657).

Newport Electric Club

A MEETING was held on 15th October at the Tredegar Arms Hotel, Newport, Mon when it was decided to form a Newport and District Electric Club. Approximately sixty people attended and the following officers were appointed. President, Mr. C. W. Buckley; vice-presidents, Mr. V. R. Treasure and Mr. E. W. Faithfull; hon. treasurer, Mr. T. N. Jones; hon. secretary, Mr. F. C. Robinson. A committee of six members was appointed and a further two committee members are to be appointed by the Electrical Contractors' Association. Full details can be obtained from Mr. Robinson, hon. secretary, c/o Santon, Ltd., Somerton Works, Newport, Mon. Monthly meetings will be held on the second Tuesday in each month.

The Motor Show

Repair and Maintenance Equipment Provide Main Electrical Interest

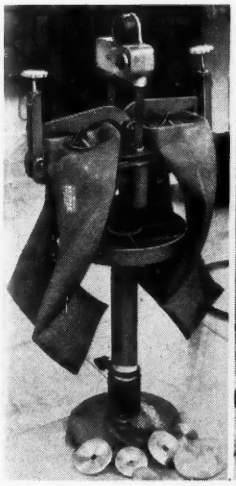
WITH no prospects of being able to buy a new car for at least five years, even if it can be afforded, the models on show at the thirty-sixth International Motor Exhibition at Earls Court, London, hold little more than an academic interest for most of the visitors. In any case, with manufacturers inevitably concentrating on the production of current types, there are scarcely any new designs to see, while modifications and improvements to existing models are generally of only a minor nature.

Since electrical operation has been adopted as standard for most of the normal auxiliary services even in the lowest priced cars, it is mainly to the luxury models that one must look for electrical developments. Pushbutton operation of windows, partitions, hoods, blinds and radio aerials is increasing and in one " super " model there is a cocktail cabinet which is electrically operated to extend over the back seats.

Considerable attention has been paid to improving the interior illumination and concealed lighting is used in a number of instances. Provision is made for the lights to come on automatically when the doors are shut and also for the stepboards to be illuminated when the rear doors are opened. Double-dipping headlamps are now being installed as standard on the majority of new cars. Although there is a tendency for electrical control and indication devices to become less obtrusive, greater use is being made of pilot lamps to indicate such things as bulb failure, choke position and oil circulation, and if the heater is on. Radio loudspeakers are now being fitted for both back and front seats.

An exhibit which is attracting a great deal of attention is an apparently normal Hillman " Minx " car which, by an ingenious lighting scheme carried out by Pearce Signs, Ltd., with the aid of " Atlas " fluorescent lamps, periodically changes dramatically to give an " X-ray " of the internal structure with the mechanism in action.

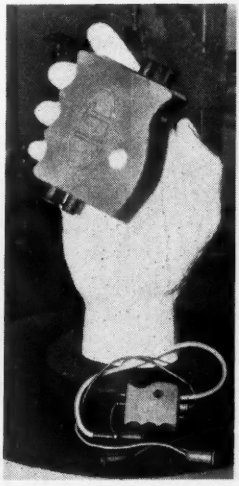
Among the exhibits of individual component manufacturers, especially comprehensive displays of electrical equipment



Left: **Dunlop tube repair unit**

Below: **Kerry's " Southwell " car washer**

Right: **Stenor ignition tester**



are shown by S. Smith & Sons (England), Ltd., Simms Motor Units, Ltd., C.A.V., Ltd., and Joseph Lucas, Ltd., the last-mentioned company demonstrating its double-dipping headlamps, television interference suppressors, new distributors with a measure of interference suppression built in and a new wiper for curved windscreens operated through a two-speed switch.

A complete range of fog, driving and pass lamps is shown by the Notek Electric Co., Ltd., while with new driving and fog lamps introduced by Marchal Distributors, Ltd., is a new horn which plays a tune. Multi-note horns are also a speciality of Trico-Folberth, Ltd., whose products include in addition direction indicators, windscreen wipers and fans. Magnetos are seen in operation on the British Thomson-Houston Co.'s stand together with impulse starters, electric speed indicators and car lamps. Demonstrations of the rough treatment which car lamps will withstand are given by both Ceag, Ltd., and Rival Lamps, Ltd. E. K. Cole, Ltd., Philips Electrical, Ltd., and World Radio, Ltd., are among manufacturers showing car radio sets. Personal heater pads made by William Clark (Spare Parts), Ltd., give increased travelling comfort.

Service Equipment

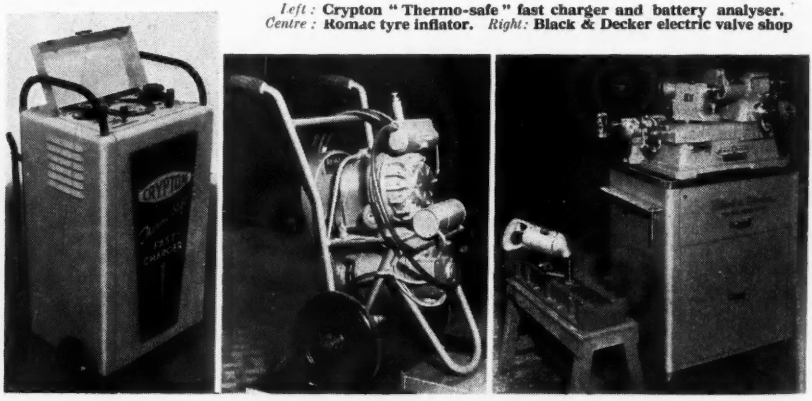
In view of the difficulty of obtaining new cars it is not surprising that special attention should be focused this year on equipment for keeping the older cars on the road and it is in the service equipment section that most of the new apparatus is to be found. Testing equipment of all kinds is particularly prominent.

Besides displays of engine testing apparatus by the Armature Manufacturing Co., Ltd. ("Octopus"), Runbaken Electrical Products and others, we noticed among the wide range of Crypton diagnosis equipment a new motor analyser of special interest in view of its small size, simplicity and low cost. Three new types of special equipment, the Bradbury static balancer, the Weaver dynamic balancer and the V.L.C. electronic balancer are demonstrated by G. T. Riches & Co., Ltd. In addition to diagnosing quickly any ignition fault, the Stenor ignition tester may also be used as a substitute condenser, thus enabling an otherwise immobile vehicle to be driven home.

Apart from an electric valve shop in a new streamlined cabinet, Black & Decker, Ltd., include in their display sanders, drills, portable saws and vitrifiers. A 10in portable saw and series of solder guns with straight handles are additions to the range of Wolf fixed and portable electric tools. Two-speed portable heavy-duty electric drills of $\frac{5}{8}$in and $\frac{1}{2}$in capacity accompany $\frac{1}{4}$in and $\frac{5}{16}$in drill guns and screw guns on the Desoutter stand, and Duplex Electric Tools, Ltd., show sanders, grinders, polishers, shears and drills. Flexible shaft machines are a speciality of B. O. Morris, Ltd.

A comprehensive display of electric motors for use in the modern garage and workshop is featured by the British Thomson-Houston Co., Ltd., together with items of control gear.

Left: **Crypton "Thermo-safe" fast charger and battery analyser.** *Centre:* **Romac tyre inflator.** *Right:* **Black & Decker electric valve shop**



Triangle Products, Ltd., is exhibiting a range of portable arc and spot welders. The latest addition to the British Oxygen Co.'s " Argonarc " welding equipment is a water cooled shield on the Mark III torch for continuous heavy-duty work. Electroplating and polishing equipment is exhibited by R. Cruickshank, Ltd., and for degreasing there is the Mann, Egerton electric alkaline tank fitted with air agitator.

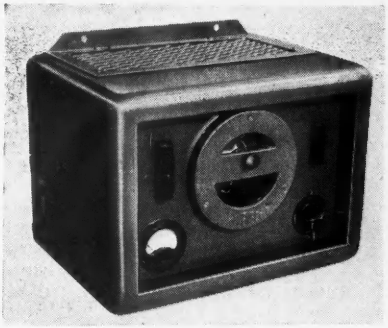
The Laycock 8-ton heavy-duty electric lift requires no excavation and provides an unobstructed working space beneath. A 3-ton model is shown by Skihi, Ltd. Kerry's new " Southwell " car washer is suitable for up to three guns. Compressors for both paint spraying and tyre inflation are well to the fore and B.E.N. Patents, Ltd., have a particularly comprehensive display. A neat new Romac portable unit for tyre inflation displaces 5 cu ft/min at a washing pressure of 150 lb/sq in.

For tube repairs the Dunlop Rubber Co., Ltd., has a new electrically heated unit, dealing with two tubes at a time and incorporating a 300 W thermostatically controlled element and Venner time switches. The new Stenor " Weldmaster," which automatically switches itself off when the vulcanizing process has been completed, has been developed to deal successfully with every type of tyre.

Battery Chargers

Several new battery chargers make their first appearance. The Crypton " Thermo-Safe " combined fast charger and battery analyser is only about half the size of previous fast chargers, is lighter and cheaper. It has a maximum output of 100 A for 6 V batteries (80 A for 12 V) and utilizes a new method of capacity testing which is claimed to apply laboratory standards of accuracy to commercial tests. Thermostatic control is used for tripping. The rectifier is fan cooled.

Completely automatic operation with no skilled attention required is the aim of the new Partridge Wilson " Davenset " pram charger. Suitable for dealing with twelve cells, it is designed to taper the charging at a predetermined rate. A metal rectifier is used and the ballast is incorporated in the transformer. The apparatus is finished in " Dimenso." Among the Westinghouse single and multi-circuit chargers is a new model of the " Westric " unit for home use



Partridge Wilson " Davenset " charger for electric prams

incorporating a tell-tale lamp and an improved type of " Westalite " rectifier unit. A new Oldham charger has a range of from one to four 6 V batteries with a variable charging rate of 3 to 8 A. Other interesting units are to be seen on the stands of F. C. Heayberd & Co., Ltd., S. Guiterman & Co., Ltd., and Lister Equipment, Ltd.

A novel display piece showing a tugboat towing a large heavily laden barge with discarded starting handles is seen on the stand of Chloride Batteries, Ltd., whose " Double-Life " batteries are of special interest. The " Dagenite Dual-Life " batteries also make their reappearance on the Peto & Radford stand. The " Ediswan " display includes examples of " Crown Standard " and " Extra-Life " batteries.

The methods of packing batteries for export demonstrated on the Young Accumulator stand gives complete protection during transit and handling. It utilizes a thick resilient shock-absorbing material in two halves to the shape of each individual battery. Examples can also be seen of the special packing used by Joseph Lucas (Batteries), Ltd., for export consignments of dry-charged " ready for immediate use " batteries.

With a complete range of " Crysteel " vitreous enamelled lighting reflectors, and floodlights for garage and other use, Benjamin Electric, Ltd., show a new fluorescent reflector, the " KK Flurolier," with slots on each sloping face to provide an upward light component. It takes a single 4ft 40 W lamp. Photographs depict actual lighting installations in the motor industry.

Business Tenancies

Procedure Under the Leasehold Property (Temporary Provisions) Act

By F. E. SUGDEN, A.C.I.S., BARRISTER-AT-LAW

RECENTLY the Leasehold Property (Temporary Provisions) Act, 1951, was passed which gives extensive relief to tenants of shop premises, particularly those who are not protected by the Landlord and Tenant Act, 1927. This Act protects the occupier of a shop who has a tenancy agreement which comes to an end by effluxion of time or by a notice to quit within a period of two years from the date of the commencement of the Act, provided that the tenant is not protected by the Rent Restriction Act. This also applies to a shop with living accommodation over it but where the shop is let separately from the living accommodation.

Application for New Lease

Where the tenancy of the occupier of a shop expires by effluxion of time or he is given notice to quit, the tenant must make application for a new lease not later than one month before the date of expiry of the tenancy or not later than one month after receiving the notice to quit.

Where the tenancy expires by effluxion of time, the landlord may at any time, not earlier than four months before the date on which the tenancy will expire, serve a notice on the tenant requiring him, within a period of one month from the date of the notice, to say whether he elects to make application under the Act or not. Where such a notice is served no such application can be made in relation to the expiring tenancy after the end of that period.

The application has to be made to the local County Court in the district where the premises are situated. If all the circumstances appear reasonable, the Court may order that the tenant shall be granted a new tenancy at such rent and on such terms and conditions as the Court thinks reasonable. In fixing the rent, terms and conditions, the County Court will disregard any considerations arising from the personal circumstances of either of the parties.

The period for which the Court will order a new lease will be one year beginning with the end of the expiring tenancy but it will not grant a new lease if it is satisfied that the tenant has broken any of the terms or conditions of the expiring tenancy; or that the landlord has offered to afford, on reasonable terms, alternative accommodation which in the opinion of the Court is suitable for the purposes of the tenant's business; or that the landlord reasonably requires possession in order that the premises may be demolished or reconstructed; or where the landlord is a local authority and it would be against public interest to grant such a lease; and, finally, having regard to all the circumstances of the case greater hardship would be caused by ordering the grant of a new tenancy than by refusing to do so.

Section 15 of the Act provides that there shall be no appeal against any determination or order of the Court under the portion of the Act which refers to shop premises, except with the express leave of the Court.

Tenants Already Protected

It has to be distinctly understood that a tenant cannot avail himself of this new Leasehold Property (Temporary Provisions) Act if he is already protected by the Landlord and Tenant Act, 1927. In a similar way he cannot avail himself of this Act if he is already protected by the Rent Restriction Act, i.e., where the premises consist of a house and shop combined whose net rateable value is not more than £100 in London or £75 in the provinces. The Act does not apply to tenancies in Scotland or Northern Ireland.

Wholesalers' Dinner

The Electrical Wholesalers' Federation announces that its next annual dinner will be held at the Savoy Hotel, London, on 20th March next. It will be preceded by the annual general meeting.

Engineering in Europe

Survey of Current Literature

MORE than almost any other European country, Switzerland has become an experimental ground for progressive technical development. The very geography and climate of the country, as well as the lack of raw materials, set their own problems while a certain geographical and political seclusion compels Swiss engineers to concentrate on overcoming the severity of conditions of life.

All this is well shown in the subject of power transmission across Alpine ranges, where every detail of the construction counts much more for the safety and reliability of the service than elsewhere. The question of the conductor material for 380, 225 and 150 kV lines crossing 7,500ft high mountain ranges is one of the most important, and it has been decided to favour steel-cored aluminium and steel-Aldrey conductors. The advantages of these materials could by no means be reaped directly, but had to be bought step by step at the price of repeated re-design of masts, change of conductor arrangement and even alteration of the span. The jointing of the conductors, after some unsuccessful trials with conventional conical and press joints, was eventually done by aluthermy-welding which was found completely satisfactory. Light-weight winches for conductor erection at high altitudes and special oscillation dampers for the conductors had to be developed, because there were cases of longitudinal oscillations during which conductors erected 75ft above ground made contact with the ground. The greatest problems arise with 150 kV lines; at 50 kV and below aluminium lines become dearer than copper-conductor lines.—" Aluminium in the Construction of Overhead Lines," R. Vögeli, *Bull. Ass. Suisse Elect.*, Vol. 42, pp. 572–575, 1951, in German.

Direct Power Tests

This review of the facilities existing in France for the full-scale testing of plant in operation and the use made of them in the development of plant for still higher voltages indicates that while the actual transition in France from 63 to 225 kV was achieved through four intermediate stages, two or even three of the latter could now be omitted without taking any risks. This does not contradict the main thesis that direct tests are the only way of ascertaining actual performance of plant and materials under increasing stresses.

In more detail, the breakdown statistics of the 63 kV cable system of the Paris region are analysed, this being an example of one of the most important kinds of direct tests by statistical analysis. The author then discusses artificial faults as a means of testing installations, and endurance tests under conditions of special severity (both on sections of existing systems) and describes opportunities for development tests on cables offered by the experimental station at Chevilly.

The last part of the paper is a comprehensive description of the research and test centre of the French h.v. systems at Chevilly with its extensive system of experimental substations and installations for many special purposes. The Chevilly Research Centre is claimed to be at present the largest and most up-to-date of its kind.—" The Role of Direct Tests in Power Systems in the Development of H.V. Plant," M. Laborde, *Bull. Soc. Franc. Elect.*, Vol. 1, No. 4, pp. 157–176, April, 1951, in French.

Impulse Testing

The author has shown previously that it should theoretically be possible to detect and locate insulation faults produced in transformer windings by impulse tests with chopped waves much more reliably and accurately than by those with full waves. He has also predicted that it would be preferable to energize and load the transformer, because in this way a sufficiently high current at commercial frequency would be set up to produce follow-through current at the point of damage, directly after the

puncture by the chopped wave, of an intensity and duration to make it safe and easy to locate the fault point. The problem lies in the duration of this current between the short-circuited turns, because the duration of such a current set up by a chopped wave is only of the order of a few microseconds, whereas that produced by full impulse waves lasts hundreds of microseconds. That is why auxiliary voltage and current are needed.

In the United States and Sweden experiments were made in this direction, with the transformers under test energized but not loaded. They were unsuccessful and the author gives a simple explanation of why this is inevitable, unless the damage done to the transformer is very considerable —in which case full-wave tests would be adequate (and these may be carried out without energizing the transformer).

The present communication gives the full experimental confirmation of the author's theoretical predictions and the details of the method and set-up of the tests. It is emphasized that the chopped-wave method does not even require a cathode-ray oscillograph, although for convenience and greater accuracy it will generally be used. A slight complication of the method is the necessary synchronization between impulse and a.c. supply.—" Impulse Testing of Transformers with Simultaneous Excitation and Loading," P. G. Provoost, *Electro-techniek*, Vol. 29, No. 20, pp. 373–378, 27th September, 1951, in Dutch.

German Fuse Design

The re-starting of the Siemens works after the war gave an opportunity for incorporating research results, which had been obtained partly during the war before the stoppage of work, in the first post-war products put on the market. In the case of low-voltage fuses these results referred mostly to the arc-quenching process, temperature rise and overload capacity. It was found that the power liberated near the foot of the arc on the fusible conductors is used up in evaporating the latter and that, therefore, the propagation rate of the arc itself is directly proportional to the instantaneous current and inversely proportional to the thermal capacity of unit length of fusible conductor. Further results concerned the voltage gradients of the arc burning in sand; they were found to vary almost linearly and to go up to 400 V/cm for heavy currents. The minimum gradient is obtained at about 100 A (there being two linear sections of the characteristic joining up at this current value) which point is of the greatest importance for arc extinction.

The design principles developed and used in the new fuse type are in the main multiple fusible conductors, mostly of copper, each of which consists of two halves connected by tin bridges and with weakened cross-sections near the bridges. The melting of the tin bridges and considerable heat accumulation at the point of fusion lead to formation of bronzes by diffusion of the tin into the copper; the resistance of the bronze, being higher than that of either copper or tin, leads to a further temperature rise in a confined space, and this to a rapid blowing of the fuse. At the same time the overload capacity may be considerably increased and the rate of combustion, or evaporation, of the fusible conductors made more uniform. Both these improvements represent a considerable step forward in the direction of better " calibration " of the fuses for certain fusing currents than has hitherto been possible.—" Structure, Mode of Action and Operational Characteristics of the New NH-Fuses," O. Müller and H. Paetow, *Siemens Zeitschrift*, Vol. 25, No. 3, pp. 149–153, July, 1951, in German.

Transistor Stability

The use of transistors is one of the newer important developments in high and low frequency amplifier technique, based on Bardeen and Brattain's discovery in 1948 of the amplifying effect exhibited by the semi-conductors germanium and silicon. The striking advantages of transistors over thermionic valves are not only that they save all the various materials and complicated operations of thermionic-valve production and are therefore cheap and simple, but also that they do not consume heating current. Their efficiency is high, their heat losses low, and they are also insensitive to mechanical vibrations or shocks. Satisfactory stability of operation has, however, still to be achieved. Some development work has been done in this respect, the value of which is by no means restricted to practical problems, since the theory of semi-conductors has been clarified and this knowledge can be applied in many other fields as well.

This article surveys broadly the theory of transistors, the characteristics of the various kinds and then discusses the main types of possible amplifier circuits using transistors, for d.c. low and high frequencies. The comparatively slow rate of progress in amplifier circuits of practical usefulness—despite the amount of work put into investigations—may partly be due to the fact that the principles to be followed were originally taken from thermionic valve amplifier technique and the essential differences in the behaviour of transistors and valves have only become apparent recently. This invariably stimulated the development of new transistor types, of which the article lists the most important, i.e., A-transistor, wedge-transistor, coaxial and filament transistor, p-n-p transistor, transistor-tetrode, photo-transistor and fieldistor. Two bibliographies of 42 references give a good cross-section of the prolific literature on the subject.—"Amplifiers with Transistors," H. Fricke, *A.T.M.*, No. 186, T80-81; T82-83, July, 1951, in German.

Readers may arrange, by request, to obtain accurate full translations of any of the articles abstracted in this section, at the usual rates.—Editors, *Electrical Review*.

Large Power Transformers

I.E.E. North-Eastern Chairman's Address

SOME of the engineering problems associated with large power transformers, for operation on e.h.v. systems, were discussed by Mr. E. C. Rippon (C. A. Parsons & Co., Ltd.) in his address as chairman of the North-Eastern Centre of the Institution of Electrical Engineers. The broad engineering aspects of the subject were considered and trends both abroad and in this country reviewed. The chairman confined his remarks, however, to the dielectric problem, with particular reference to the forms of windings adopted.

First, the implications of system characteristics and operating conditions were discussed. It had been agreed internationally that any future systems having operating voltages greater than 220 kV would be designed and operated with effectively earthed neutrals at each transformation point on the system. This limited the power frequency voltage to earth to a value not exceeding 80 per cent of the line to line voltage, and allowed lightning arrestors of a reduced voltage rating to be applied. The insulation level of the whole system could thus be reduced. Power transformers could also be used with graded insulation which, coupled with the lower overall insulation level, reduced apparatus costs.

After comparing various proposals for basic insulation levels Mr. Rippon said that the highest open circuit voltage on the extreme tapping of a transformer should have no influence on the insulation level chosen; it should be determined by the highest operating voltage of the system to which the transformer was connected.

The most searching dielectric test on a transformer was the impulse test. Experience had shown that voltage and current records thus obtained formed a reliable basis for acceptance or rejection of the transformer.

On the subject of windings the chairman pointed out that they had to be designed to withstand thermal, mechanical and dielectric stresses under test conditions and in service. Windings were invariably a compromise of these three conflicting requirements; for example, when paper insulation was added to meet dielectric stresses, the additional thickness reduced the thermal rating of the winding. The ability to withstand impulse test level was probably the main yardstick used by the engineer to design a given winding. Intercoil stresses were a minimum when the impulse voltage to earth was distributed linearly throughout the winding. Few windings had this ideal linear distribution and ingenious devices had been devised to improve the voltage characteristics.

After a detailed treatment of various types of e.h.v. transformer windings the chairman dealt briefly with trends in the

design of transformers both here and overseas. With regard to the future, Mr. Rippon thought it unlikely that the transformer engineer would have to produce power transformers for voltages in excess of 400 to 500 kV. His task would be materially assisted by improvements in lightning protective devices tending to reduce the impulse voltage levels of station apparatus.

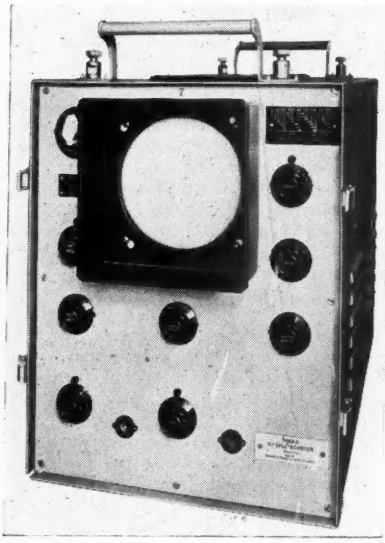
The use of multi-layer, concentric winding designs would increase rapidly for three-phase transformers and particularly for auto-transformers, probably to the exclusion of disc coil windings. Graded shell type transformers would also play a leading part and when very large bank outputs were required, single-phase shell type transformers might be the solution.

High-Frequency Spectrometer

A COMPLEX waveform analyser with an exceptionally high resolving speed, the high-frequency spectrometer made by Standard Telephones and Cables, Ltd., is capable of analysing the whole of the frequency spectrum between 6·4 kc/s and 4 Mc/s. It employs a 6in cathode ray tube, on the screen of which a visual indication is given of both the frequency and the amplitude of the components of a complex waveform. The display is arranged as a number of vertical lines, the frequency of each component being indicated by its horizontal position while the amplitude is directly proportional to the length of line traced. Permanent records can be obtained by the use of either still or cine cameras.

The instrument analyses a complex waveform by first amplifying the waveform and then applying it to 27 band-pass filters in parallel, spaced at 3 per octave over a range of 9 octaves. Individual filters transmit frequencies present in their pass bands, and apply them to a rectifier valve associated with each filter. The d.c. output from these rectifiers is stored in reservoir capacitors, which are scanned in turn by a high-speed rotary switch. The switching circuit applies the d.c. voltages to a convertor circuit, which supplies half-wave a.c. to the vertical plates of the cathode ray tube, causing the beam to trace a vertical line. Simultaneously, the horizontal plates are supplied with a d.c. potential from the rotary switch, which causes the beam to move to a predetermined horizontal position.

Standard Telephones h.f. spectrometer



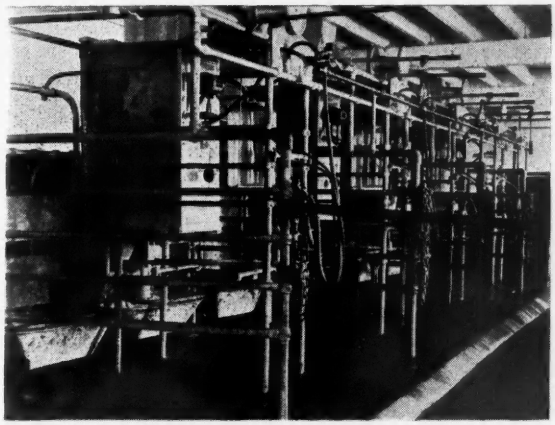
Each filter is allocated a specific horizontal position for the beam on the tube screen and the adjustment of the switchgear is such that the vertical plates are energized by one particular filter only when the beam is in the horizontal position identified with that filter. Therefore, if a frequency is present in any particular filter, a vertical line will appear in the appropriate position on the screen. The spacing of the lines is arranged in groups of three and four to facilitate identification.

A switch connected to the storage capacitors determines the charging and discharging times of the d.c. storage circuit associated with each filter, and thus enables the duration of the display of a transient on the screen to be set to either of two values. The display produced by a steady waveform will, of course, appear steady on the screen, as the storage capacitors are scanned continuously by the rotary switch 23 times per second.

The instrument operates from 220/240 V, 40/60 c/s, mains, but an auto-transformer is available to enable it to be operated from other voltages.

Public Transport Conference

The Public Transport Association Inc., announces that its 1952 Conference will be held at Torquay on 6th, 7th and 8th May next.



Four-unit parlour type milking equipmen. at Upper Wyke Farm, St. Mary Bourne

Milk Treatment

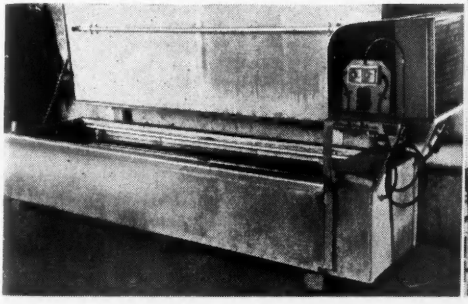
New Methods at Hampshire Farm

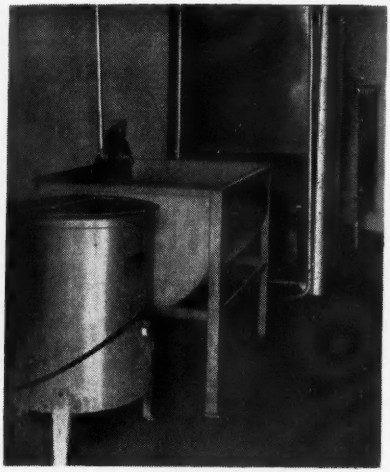
HYGIENE, convenience, reduction in labour, avoidance of possible waste, and economy in general, have all been taken into consideration in designing the electrical installation just completed at Mr. N. E. V. Dance's Upper Wyke Farm, St. Mary Bourne, Hampshire. The scheme enables two men alone to undertake the milking of a herd of fifty Ayrshire T.T. cows, the milk being untouched by hand from the time it leaves the cow until it is cooled and in the churn ready for despatch. Sterilizing of the whole pipe system is readily and efficiently carried out by simply turning on a tap.

For the milking, a Gascoigne four-unit parlour type equipment (driven by a 1¼ h.p. motor) is employed, it being possible to deal with all the cows in milk (at present twenty-eight) in under three-quarters of an hour. The milk from the cows, after automatic weighing, is taken through a permanent stainless steel pipe system to the surface type cooling apparatus, whence it goes straight into the churns.

To provide the cold water required for the cooling purposes a Gascoigne "Rotor-Freeze" unit employing the "ice bank" system has been installed. Equipped with a Kelvinator refrigeration unit, this apparatus is of sufficient capacity to cool six churns from 90 to 50 deg F. The water, which is

Water cooled in the "Rotor-Freeze" unit is circulated continuously through the milk cooler





Washboiler for supplying supplementary hot water, with the "Electrobloc" unit in background

circulated continuously through the cooler by means of a water pump driven by a ¼ h.p. motor, is brought down to a temperature of about 40 deg F in a cork lined galvanized iron tank approximately 9ft by 2ft by 15in high, incorporating a system of refrigerated copper tubes. The rate of cooling is adjustable to meet varying operating conditions. If desired the "Rotor-Freeze" system can also be employed for in-churn milk cooling or for in-churn cold storage.

The pipework from the milking machines to the coolers is sterilized by steam from a 4 kW "Electrobloc" which also provides steam both for a churn sterilizing stool and for a Woolley "Whizzer" chest for sterilizing the milking clusters, etc., in addition to furnishing hot water for washing purposes. A supplementary hot water supply is given by a wash-boiler. A Venner time switch controls the "Electrobloc" unit so that it is on circuit only during the off-peak hours between 6 and 11 p.m. Other electrical aids on the farm include a "Miracle" 40 h.p. hammer mill and a Beresford 3 h.p. submersible pump for getting water from a well.

Although the complete installation has not been in service long enough to obtain detailed operating figures, the cost of electricity for all purposes is expected to work out at about £100 a year. So satisfied is Mr. Dance with the installation that he is already contemplating the adoption of a similar scheme for his other farm, Finkley Manor, which adjoins Upper Wyke Farm.

Agricultural Engineering

IN the first presidential address to be delivered before the Institution of British Agricultural Engineers, Mr. F. E. Rowland (G.E.C.) referred to the growth of the agricultural engineering industry since the inception of the Institution in 1938. The annual production of the industry was now valued at more than £1 million while the steel consumption last year was 385,000 tons. This had created the need for a separate Institution for agricultural engineers. Furthermore, there was no other organization which embraced within its limits such subjects as civil, mechanical and electrical engineering, and also aspects of soil science, biology and chemistry.

The Institution was now recognized by the Ministries of Agriculture and Education, the City and Guilds of London Institute, the Royal Agricultural Society and the National Farmers' Union. An important part of the Institution's work was concerned with agricultural education. The first examination for the National Diploma in Agricultural Engineering for which the Institution was responsible was held this year. The Institution had also been associated with the establishment of the M.Sc. course in agricultural engineering at the University of Durham.

In conclusion Mr. Rowland said that there was much to be done if agricultural machinery was to be fully utilized and production increased. Whether further mechanization could reduce production costs, and also whether better use could be made of existing machinery, were two of the major problems to be tackled in the future.

Purchasing Officers' Association

THE East London Branch of the Purchasing Officers' Association held its opening meeting of the 1951–52 season on 15th October at the Valentine Hotel, Ilford, when Mr. R. J. Mitchell, the national hon. treasurer of the Association, presented a paper on "The Study of Prices and Sources of Information."

NEW BOOKS

Electro-magnetic Theory. By Oliver Heaviside, F.R.S. Complete and unabridged edition of Vols. 1, 2 and 3, with a critical and historical introduction by Ernst Weber. Pp. xxx+386; figs. and index. E. & F. N. Spon, Ltd., 22, Henrietta Street, London, W.C.2. Price 63s in U.K.

This is the *magnum opus* of a man who was one of the most distinguished pioneers of electrical science and contains his classic exposition of the fundamental theory of electro-magnetism. It is a most attractive reproduction of Heaviside's original text and can be strongly recommended to all engineers and students who are interested in mathematical ideas. They will find, on a first reading, that Heaviside appears to have had the faculty of being able to discover mathematical theorems by a sort of intuition that dispensed with the academic processes of proof. But a close examination of Heaviside's original text shows how he established the principle that the starting point of any strictly logical treatment of a branch of mathematics must be a set of undefined elements and relations, and a set of improved theorems involving them; from these all other theorems can be derived by the methods of mathematical logic. Recently this important principle has been rediscovered and proclaimed by Einstein—nearly eighty years after Heaviside. This simple example shows how valuable a detailed study of Heaviside's original text can be to research workers and students.

The present edition is preceded by an introduction by Dr. E. Weber comprising a short biography of Heaviside together with appreciations of his contributions to vector analysis, electro-magnetic field theory, transmission line theory, operational mathematics, loaded communication lines and electro-magnetic units. Dr. Weber's biographical statement, however, contains no reference to Heaviside's unpublished fourth (and concluding) volume of "Electro-magnetic Theory." Heaviside worked on this fourth volume for over twenty years and produced a unified field theory in which electro-magnetism had been correlated with mass properties and gravitation; Einstein is still struggling with this problem of unification.

As one examines this excellent edition of Heaviside's original text, with its superb discussion of the forces and fluxes of electro-magnetic energy in space, one is reminded of his remark about Clerk Maxwell: "Such men," he said, "live the best part of their lives after they are dead." Such a remark applies to Oliver Heaviside himself.—H.J.J.

Transients in Electric Circuits. By W. B. Coultard. Pp. 260; figs. 97; index. Sir Isaac Pitman & Sons, Ltd., Parker Street, Kingsway, London, W.C.2. Price 32s 6d.

Transient phenomena are all important in a wide and ever-growing field of electrical engineering. The author has ranged in subject matter from filter circuit design to spot welder characteristics and the mechanics of indicating instrument movements. Heaviside's operational calculus is demonstrated throughout the book as giving the most direct approach to the solution of transient problems, and although a rigorous treatment is not always presented, sufficient is given to enable the engineer to apply the method outlined.

A review of the general theory underlying Heaviside's notation and the use of the expansion theorem forms an introduction to the book, which is then divided into two main sections. The first gives the theory of "lumped" circuits and the second deals with "smooth" circuits, these being treated as limiting cases of a succession of "lumped" circuits.

The current resulting from the application of d.c. and a.c. voltages to series, parallel and mutually coupled circuits is determined. The majority of solutions are given in symbolic form, but several numerical examples show the application of the methods in detail. A working knowledge of Heaviside's methods is almost essential for the study of transient phenomena, and is certainly required to gain most benefit from this book. One item of particular interest in this section is the relating of electrical equivalent circuits to various mechanical systems, thus extending the scope of the equations presented. Two chapters are devoted to the inclusion of boundary conditions by the use of subsidiary equations, and the application of

sinusoidal and damped voltages using the Duhamel integral. Transient effects in machines, including starting and hunting characteristics, are considered in general by neglecting the complex behaviour of the iron in the machine.

The second section commences with a study of the propagation of waves along a line and includes filter circuits as well as transmission lines with alternative terminations. The building-up of voltage and current in a line using operational equivalencies and Bessel functions is also included. The closely allied problem of eddy current effects in plates and conductors is studied, with particular reference to high frequency heating. Following a chapter outlining the Fourier series and integrals the book concludes with a survey of the application of operational methods to circuits with variable parameters, and indicates the use of graphical methods.

The book is likely to be of great value to those engineers concerned with predicting current surges, and forms a useful guide to the use of Heaviside's operational methods.—K.W.W.

Books Received

The Oxide Coated Cathode, Vol. II. By G. Herrmann and S. Wagener. Pp. 311; figs. 152; bibliography and index. Chapman & Hall, Ltd., 37, Essex Street, London, W.C.2. Price 42s.

Gas Discharge Lamps. By J. Funke and P. J. Oranje. Pp. 270; figs. 171; index. Cleaver Hume Press, Ltd., 42a, South Audley Street, London, W.1. Price 30s in U.K.

Industrial Administration and Management. By F. L. Meyenberg, M.I.Mech.E. Pp. 387; figs. 30; index. Sir Isaac Pitman & Sons, Ltd., Parker Street, Kingsway, London, W.C.2. Price 35s.

Refrigeration Principles and Practice. Edited by E. Griffiths. Pp. 579; figs. 173; index. George Newnes, Ltd., Tower House, Southampton Street, London, W.C.2. Price 42s.

Brisbane Trolley-Buses

GREAT interest and enthusiasm was evinced by the citizens of Brisbane, Queensland, when the first of their fleet of modern trolley-buses was recently put through its paces. Eight of these vehicles are now in service. When proposed extensions to the route have been completed, a total of 30 vehicles will be in operation. They are all being manufactured by the Sunbeam Trolley-bus Co., with electrical equipment made by the British Thomson-Houston Co.

The electrical equipment is of the non-regenerative type with stabilized-rheostatic braking and the compound-wound motors have a one-hour rating of 115 h.p. at 550 V. The main contactor panel is in a weatherproof metal enclosure on the side of the chassis underneath the body floor and, to conserve space, the master controller is mounted under the driver's seat. This controller is of the well-known "scissors" type (developed by the B.T.H. Co.) and operates the electro-magnetic contactors from the 550 V supply. The company introduced foot-operated contactor control for trolley-buses in 1922 and the system has since been universally adopted.

The first of thirty trolley-buses to go into service in Brisbane, Queensland (*Courier Mail*, Brisbane)

Commerce and Industry

Electrical Executives' Committee

Civic Exhibition at Woolwich

AN agreement was recently signed by which a National Joint Committee is to be set up to negotiate salaries and conditions for the managerial and higher executive officials of the British Electricity Authority and Electricity Boards. The Committee will deal with staff who are not covered by the National Joint Board schedule or the National Joint Council scales; it will extend to superintendents of power stations of 50 MW or over. Certain of the higher positions, regarded as "non-negotiable," will not fall within the new arrangements.

There will be 32 members, 16 representing the Authority and Boards and an equal number representing the staff associations; they will be nominated as follows:—Central Authority or headquarters organization 4, Divisional organizations of the B.E.A. 4, Electricity Boards 7, North of Scotland Board 1; Association of Managerial Electrical Executive 6, Electrical Power Engineers' Association 5, National Association of Local Government Officers 5.

Six sub-committees will be appointed to deal with terms and conditions of service for the various grades:—Managerial; operational; administrative, secretarial and executive; accountancy; power station superintendents; and district managers (salaries £1,000 and above). Members of the sub-committees need not be members of the National Joint Committee.

Provision is made for reference of differences which cannot be settled by the Committee to the Industrial Court or other agreed tribunal.

Contract Price Adjustment Formulæ

The following are the latest figures for use in the B.E.A.M.A. contract price adjustment formulæ:—Rates of pay: the rate of pay for adult male labour at 13th October shall be deemed to be 120s. Costs of materials: the index figure for intermediate products published by the Board of Trade on 13th October is 367·6 and is the figure for September.

Arc Welding Faults

The British Welding Research Association has published an illustrated wall chart 3ft by 2ft with 37 half-tone illustrations indicating common faults that can occur in the metal arc welding of steel. The chart is printed in two colours and is mounted on a strong backing board suitable for direct mounting to the walls of welding shops, offices, etc. Copies of this chart entitled, "Faults in Arc Welds," are obtainable from the Publications Department of the Association, 29, Park Crescent, London, W.1, price 7s 6d each, post free.

"Exide" Motor Show Luncheon

On Wednesday last week the customary luncheon in connection with the Motor Show was held by Chloride Batteries, Ltd., at the Clarendon Restaurant, Hammersmith. Mr. H. V. Schofield, director (sales) of the company, presided and proposed the toast "The Press and the Guests." In the course of his remarks Mr. Schofield referred to promising new techniques in lead battery manufacture including a microporous plastic separator which, he said, would increase life and improve efficiency. He said that electricity was the "raw material" common to all industries; the present shortage was due to the lack of foresight of post-war Governments and he hoped that our new masters would put our house in order in this respect. Mr. Schofield emphasized that his company's large capital commitments had been met out of its own resources.

The toast was responded to by Sir Francis Low (*Times of India*) and Mr. Kenneth Horne (Triplex Safety Glass Co., Ltd.), who fully sustained his radio reputation.

Midlands Ideal Home Exhibition

In our last week's issue we reviewed the electrical exhibits at the Midlands Ideal Home Exhibition, Birmingham. One of the most

The display by Walker Bros. (Electrical Engineers), Ltd., at the Birmingham Ideal Home Exhibition

comprehensive displays of domestic electrical apparatus and of radio and television receivers was on the stand of Walker Bros. (Electrical Engineers), Ltd., and a section of this display is shown in the accompanying picture.

Garcke's Manual

The reintroduction of the section dealing with British electrical and allied manufacturing companies is a feature of the new edition of "Garcke's Manual of Electricity Supply" (Vol. 48) published by the Electrical Press, Ltd., 23, Great Queen Street, London, W.C.2, price £3 10s, carriage paid. An important change has also been made in the arrangement of the data relating to Electricity Boards and in a new sub-section the particulars of all operating districts within the respective Sub-Areas of the Boards have been arranged in one alphabetical order throughout for greater convenience of reference.

With a list of all the generating stations under B.E.A. control are full details of plant installed and four-year comparative tables of operating data. The directory of executive personnel has been revised and expanded.

Lighting Carbons

The General Electric Co., Ltd., announces that it will discontinue the manufacture and sale of lighting carbons at the end of this year, when the factory concerned will change over to the manufacture of other types of carbon products.

Nationalization and the Unions

The eighth of the series of twelve studies in nationalized industry produced under the auspices of the Acton Society Trust, Acton House, Church Road, Claygate, Surrey, is entitled "The Future of the Unions." It is considered that the trade unions involved in nationalization have found it difficult to adjust themselves to the altered conditions and their officials are unwilling or too much occupied to spare the necessary time to study the situation.

Nationalization appears to have increased the number of problems of status and promotion and personal relations with supervisors and employers and nationalized industries have had to face many disputes arising from these problems.

It is concluded that the unions must endeavour to broaden the basis of their activities or abandon their real *raison d'être*, the comprehensive protection of their members' interests. The study is available from the Trust at the price of 2s; the series costs 21s.

Parkinson Memorial

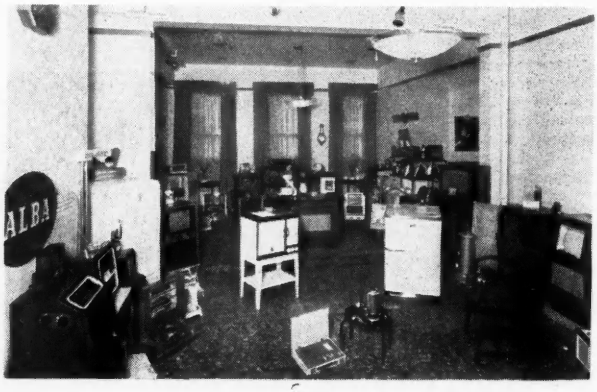
On 17th October a bust of the late Mr. Frank Parkinson by Mr. Reid Dick was unveiled at Leeds University by Mrs. D. McNicol, formerly Mrs. Frank Parkinson. In paying tribute to Mr. Parkinson (who gave £200,000 towards the cost of the Parkinson Building at the University), Sir Hubert Houldsworth, Pro-Chancellor of the University, said that the building had been built through the generosity of a man who had been educated at the University and who had later received an honorary degree there.

Free Printing Blocks

In order to assist stockists of their domestic electrical appliances in the preparation of their own catalogues and advertising matter, Falk, Stadelmann & Co., Ltd., now provide free electros. The company has issued a pamphlet illustrating the appliances for which free electros are available.

Newcastle Wholesalers' New Showroom

In the accompanying picture we show the new trade showroom of J. Gledson & Co., Ltd., electrical and radio wholesalers, of 48–52, Blackett Street, Newcastle-on-Tyne, which forms part of recent extensions to the company's premises. As will be seen, the company has a comprehensive display of radio, television and domestic electrical apparatus.



The new showroom of J. Gledson & Co., Ltd., Newcastle-on-Tyne

Simplex Conference

A conference of branch managers was held recently by the Simplex Electric Co., Ltd., and among those who spoke were Mr. E. G. Plucknett and Mr. A. G. Jones, directors and joint general managers of the company, and Mr. J. D. Johnson, manager of the Simplex Division. In the accompanying picture, Mr. Johnson is seen addressing the gathering.

At the Simplex branch managers' conference. Left to right: Messrs. A. G. Jones, E. G. Plucknett and J. D. Johnson

Educational

We have just received a copy of the University College (University of London) Calendar for the 1951–52 session. While the Calendar is primarily intended to give information regarding the various courses, its 500 pages contains a great deal of other information relating to the history of the college, its officers and staff, scholarships, exhibitions, prizes and bursaries, regulations and much other information regarding the activities of the College.

E.C.A. Surrey Branch

The annual dinner of the Surrey Branch of the Electrical Contractors' Association will be held on 9th November at the Casino, Taggs Island, Hampton Court.

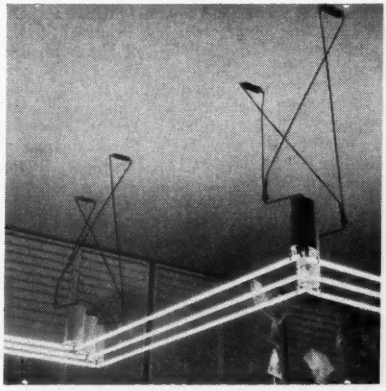
Cable Jointing Demonstration

A demonstration of aluminium conductor cable jointing was given recently to the South Wales Electricity Board in the Board's Cardiff demonstration theatre by W. T. Glover & Co., Ltd. It was attended by members of the Board, Mr E. Jones (deputy chairman) and Principal R. James, the chief engineer Mr. J. W. Bird, and senior officials, together with senior engineers of the South Wales Division of the National Coal Board and leading industrial firms. Practical demonstrations of a compression and a sweated joint were given, while the salient features of the processes were pointed out and questions invited.

Suspended Cold Cathode Tubes

When rebuilding the Shaftesbury Avenue lingerie and hosiery shop of S. Weiss & Co., Ltd., it was decided to light the interior by means of continuous runs of cold cathode tubing over the counters. As the ceiling is 12ft high it was necessary to suspend the tubes at 8ft 6in above floor level in order to provide the desired illumination of 30 lumens/sq ft. The form of suspension designed by the architect, Mr. Erno Goldfinger, is shown in the accompanying illustrations. Osram intermediate cold cathode tubing in various lengths to suit the layout of the counters was supplied by the General Electric Co., Ltd., whose Illuminating Engineering Dept. collaborated in working out the technical details of the installation. The suspensions are made of ¼in solid rod, coloured red. They are located at the junctions of the various runs of tubing, where the ends containing the electrodes are turned upwards in order that the lighting lengths may be virtually continuous. Elliptical casings attached to the suspensions conceal the electrodes, and are fitted with clips to support the horizontal portions of the tubes. These casings have been made of sufficient size to leave an air space around the end caps of the tubes large enough to avoid risk of static discharges to the earthed metalwork of the suspension system. All the tubes in each of the three runs are in series, so that connections to the power supply are made at the two ends only and the transformers have been grouped above the shop windows in a concealed position.

Close-up of two of the suspensions, which coincide with the ends of each run of cold cathode tubing



Prices of Materials

In the accompanying table we give the prices of the more important materials used in the electrical industry. The figures are those quoted on Monday last.

ALUMINIUM Ingots	ton £124 0s 0d
COPPER, H.C. Electro	ton £227 0s 0d
Fire Refined 99·7 per cent ..	ton £226 0s 0d
Fire Refined 99·2 per cent ..	ton £225 10s 0d
COPPER Tubes	lb 2s 2d
Sheet	ton £277 10s 0d
H.C. wire and strip	ton £254 0s 0d
LEAD, English	ton £176 10s 0d
Foreign	ton £175 0s 0d
MERCURY	flask £73 10s 0d
TIN	ton £1,025 0s 0d
ZINC, G.O.B. Foreign	ton £190 0s 0d
Electrolytic	ton £194 0s 0d
BRASS Tubes	lb 2s 1d
Sheet	lb 2s 4½d
Wire	lb 2s 7¼d
PHOSPHOR BRONZE	
Wire	lb 3s 6½d
RUBBER, No. 1 R.S.S. spot ..	lb 46d-46½d

Trade Announcements

Smith's Electric Vehicles, Ltd., have appointed Messrs. William Murphy, May Street, Belfast, and the Murphy Electric Co., Ltd., 7, Upper Stephen Street, Dublin, as their distributors for Northern Ireland and Eire respectively.

Sharp Control Gear, Ltd., Ashby-de-la-Zouch, has appointed J. S. Plumtree & Son, Ltd., 104, High Holborn, London, W.C.1 (telephone: Chancery 7127) to act as its sales representatives for London and the Home Counties.

Works Visit

On 19th October Dr. A. L. Geyer, High Commissioner (London) for the Union of South Africa, paid a visit to Rugby, and during the afternoon toured the main works of the British Thomson-Houston Co. In the evening he was the guest of honour at the B.T.H. Overseas Association's annual gathering. Dr. A. L. Geyer expressed his interest in the engineering training schemes of the company. He toured the works in company with Messrs. E. H. Ball (managing director, B.T.H. Co.); K. R. Hopkirk (director and chief mechanical engineer); H. L. Satchell (director, manager, Rugby Works); and E. V. Small (managing director, B.T.H. Export Co., Ltd.), and among equipment for South Africa saw 1,200 h.p., 6·6 kV synchronous motors for Durban (Roodepoort Deep); large transformers, 34/12 kV, one for Cape Town complete and ready for dispatch, others, for Durban–Colenso transmission, in course of assembly. In the turbine factory the various components of the 25,000 kW steam turbo-alternator for Colenso were seen. Other work-in-progress included the Umgeni 30,000 kW turbo-alternator; the 3,000 kW set for Queenstown, a rectifier transformer for South African Railways, and components for the third out-sized alternator (62,400 kVA, 214 r.p.m.) for a hydro-electric station in Spain.

At the evening function, the toast "Our Guests" was proposed by Mr. J. H. Smith, B.Sc. (Cape Town) and Dr. Geyer responded

Woolwich Civic Exhibition

The history, amenities and industrial development of Woolwich are the theme of a Civic Exhibition being held this week at the Town Hall. Indicative of the attention paid to health and hygiene are models of refuse disposal works, a slaughterhouse, a bacon curing factory and an ice-cream pasteurizing plant, all making extensive use of electricity. Attention is drawn in "Trouble House" to potential sources of danger in the home, such as trailing flexible cables and poor staircase lighting.

"Lebville," an all-electric model bungalow displaying the great variety of services for which electricity is used in the modern home, is attracting a great deal of interest on a stand prepared by the London Electricity Board, which is also displaying cookers, washing machines, water heaters and other appliances cut-away or "Perspex" panelled to indicate the method of operation.

The part played in television development including the cross-Channel broadcast, is the subject of a display by Standard Telephones & Cables, Ltd., while Siemens Bros. & Co., Ltd., besides demonstrating the working of a public telephone exchange, show marine communication and lighting equipment; and power, telephone and Hais ("Operation Pluto") cables. A braiding machine applying a cotton covering to vulcanized rubber insulated wire is demonstrated on the stand of Henley's Telegraph Works Co., Ltd., where specimens of cables and wire can also be seen.

Coke Oven Installation

Referring to the article describing the coke oven plant of the Consett Iron Co., Ltd., in the *Electrical Review* of 7th September, the Wellman Smith Owen Engineering Corporation, Ltd., have pointed out that as sub-contractors to the Woodall-Duckham Vertical Retort & Oven Construction Co., Ltd., they supplied the mechanical equipment units for service of the ovens, consisting of the combined coke pusher, coke leveller, and door extractor machine, the coke guide and door extractor, the clay luting lifts and the coke quenching cars.

Portuguese Imports

In the analysis of Portuguese electrical imports in 1950 (*Electrical Review*, 28th September, p. 652) an error occurred in the figures for accumulators and condensers weighing less than 8 kg per cell. The total (in thousand escudos) should read 2,978, a decrease of 4,442 on 1949, and Sweden's share 175, a decrease of 118.

ELECTRICITY BOARDS' REPORTS

Summary of Operations in 1950-51

SUPPLEMENTING the sales and revenue statistics of the fourteen Electricity Boards given in the third annual report of the British Electricity Authority summarized last week, below are recorded extracts from the individual reports of four of the Boards. Others will be dealt with in later issues.

LONDON

The London Board's report opens on a sombre note. Greater difficulties were encountered than in the first two years of the Board's operation and the signs are that these will increase rather than diminish. Capital expenditure restrictions cause most concern. In view of the heavy wartime damage, coupled with the rapidly increasing demand, any hold-up in urgently needed reinforcement schemes would entail serious inconvenience and even hardship.

Based on 1950 prices, it was estimated that for the three years 1951–54 engineering works costing £35,300,000 would be required to meet the demand, this amount being divided fairly equally between distribution systems operating at up to 11 kV and the higher voltage transmission system with associated bulk supply substations. During the year, 159,416 kVA of transforming plant at up to 11 kV was brought into commission together with a further 81,000 kVA for operation between 22 and 66 kV. Twenty-two projects associated with main bulk supply points were completed and 31 major constructional schemes were being carried out, the latter including new intake substations of 240,000 kVA and 150,000 kVA respectively at Ilford and Lambeth (Bengeworth Road) and bulk supply substations at Paddington (Moscow Road), Willesden (Kimberley Road), City (Seacoal Lane), Wimbledon (Durnsford Road), Kennington and Sidcup. Expenditure on capital works incurred during the year amounted to £5,232,165.

Attention was given to the use of alternative materials to replace scarce metals and one of the five-mile lengths of 33 kV cable laid between Ilford and Buckhurst Hill was of the impregnated gas-pressure type with an aluminium sheath (instead of lead covering) designed to withstand a gas pressure of 200 lb/sq in.

Load shedding was necessary on 207 occasions, the most drastic being on Monday, 18th December, amounting to 287,000 kW, or 19 per cent of the total potential demand, estimated at 1,514,785 kW. Though metering arrangements did not permit exact measurement, the simultaneous m.d. of the Area, estimated at 1,330,432 kW, was computed to have occurred at about 4.30 p.m. on Monday, 29th January, 1951, when no load was being shed.

Other matters mentioned in the report include changes in tariffs, supply arrangements for the Festival of Britain, extensions of public lighting by electricity requiring the connection of 3,036 fittings, and labour relations (reference being made to the unofficial strike in the Board's contracting departments which involved 1,400 men).

SOUTH EASTERN

Achievements recorded in the report of the South Eastern Board were: further reductions in the price of electricity in some districts (though it is added that rising costs point inevitably to an imminent general increase in charges); numerous mains extensions, particularly in rural areas; substantial economies from improved engineering design and more closely integrated organization; and a useful improvement in load factor.

Last February a comprehensive electrical development plan was submitted to the Board. It assumes that in the next 10–15 years the number of consumers will increase from 950,000 to 1,250,000, the present annual increment of about 30,000 falling as saturation is approached. Each consumer now takes on the average 0·75 kW at the time of system m.d. and this is expected to be at least doubled; thus the prospective demand would be of the order of 2,000,000 kW, or three times the present figure. The cost of providing for this expansion is estimated at £30 million.

Turning to extensions and reinforcements during 1950–51, the report records that 1,329 projects were approved costing £1,971,609. Schemes completed included a 30 MVA interconnection between Croydon "A" and "B" (£70,894); two 33/6·6 kV substations at Croydon (£190,096); and 33 and 11 kV reinforcement, Beddington grid point to Sutton (£127,815). Among schemes in hand were the following:—66 and 33 kV reinforcement from Littlebrook to the Medway towns (£207,608); main switchhouses, etc., at Ashford (£43,760), Broomgrove, Hastings (£27,200), West Weybridge (£38,000) and Tunbridge Wells (£63,384); change of voltage from 6·6 to 11 kV at Ramsgate (£23,735); and 6·6 kV switchgear at Dover (£11,232).

Savings in installation costs have been achieved by mounting 200 kVA transformers on "H" poles and 100 kVA transformers on single poles. A new standard and economical layout of 33/11 kV substations has been introduced in Mid-Sussex. Wider use is being made of simple

oil-immersed isolators, in conjunction with switch-fuses, in place of circuit breakers.

Power cuts occurred on 72 days (on 32 days more than once during the day). The simultaneous maximum load of 685,000 kW occurred at 12.30–1 p.m. on Sunday, 17th December; this compares with 614,000 kW in the previous year, also on a Sunday. Annual load factor improved from 44·7 to 46·5 per cent.

Restrictions on capital development called for a contraction of the development programme which the Board had contemplated. The approved capital budget permitted to the Board—£3,176,000—was not made known until 2nd August, 1950, and before the end of the year it became apparent that it would be impossible to keep expenditure on all items within this limit. Although the Board suspended all simple hire of new apparatus as from 1st January, 1951, approval had to be obtained for an additional £235,000.

SOUTHERN

Of the total capital expenditure in the Southern Area last year, amounting to some £4,500,000, approximately £4,150,000 was in respect of engineering work, network reinforcement being given priority over practically all other forms of investment in view of Government control of capital expenditure.

The chief schemes authorized during the year were as follows:—System changes to allow new bulk supply connections at Chalvey, Slough (£105,000) and Hounslow (£101,700); two new 22/11 kV substations, Heston District (£161,000) and two 33/6·6 kV substations, Portsmouth (£151,000); extension of 33 kV system, Bournemouth (£262,000); extension of 33 kV transmission for supplies to National Gas Turbine Establishment (£105,000); 33 kV transmission, Moredon to Swindon (£136,000); and reinforcement of 22 kV system to Ealing (£141,000).

An additional 40,755 consumers were connected during the year, including 1,513 farms. Maximum demand rose by 8·5 per cent to 831,840 kW and load reduction by interruption of supplies affected parts of the Board's Area on 90 days.

In the section of the report on consumer service mention is made of the proposed standard domestic tariff and preliminary steps towards the standardization of other tariffs; introduction of a uniform basis for calculating terms for the connection of new consumers; and the testing of 194 appliances during the year, 64 being subsequently modified by the manufacturers in line with suggestions made by the Board.

At 31st March last the number of persons in the Board's employ was 11,486 (against 11,189 a year before). Manual employees numbered 7,413 of whom 1,781 were engaged on contracting work. Education and training facilities included, in addition to craft and student apprenticeships, courses for senior specialist staff, a progressive training scheme for junior commercial staff, and the sending of employees on manufacturers' courses.

The year's trading resulted in a net surplus of £782,694 and the Area reserve fund now stands at £650,000, while the Board's contributions to the central reserve fund total £440,000.

SOUTH WESTERN

Finance constitutes the main problem of the South Western Board. After three years' trading it has an accumulated deficit of £113,703 and has not been able to establish a reserve fund. Last year the revision of the B.E.A.'s bulk supply tariff added £105,523 to the Board's costs (though this was offset to the extent of £76,094 by a contribution from the central reserve fund) and an additional expenditure of nearly £100,000 resulted from salary and wage awards. A considerable item is also the accumulating capital charges, some £2,500,000 being spent annually on new capital works in the Board's largely rural area.

New consumers numbered 25,494 (1,646 more than in the previous year), the most marked advance being in farms and other rural premises connected. Capital contributions and minimum guaranteed revenues to finance rural extensions have been replaced by a system of line rentals where revenue is insufficient to cover the cost of a supply. During the year line rentals for schemes involving 500 farms and 1,200 rural premises were successfully negotiated. The average rental under the scheme in the case of farms is 7s 6d a week and for cottages only 8d a week.

The simultaneous m.d. on the Board's system in 1950–51 was 399,400 kW against 385,200 kW in the previous year. Grid control issued load shedding instructions on 139 days but actual disconnection of consumers was limited to 58 days.

There was a substantial increase in engineering work during the year, 544 circuit miles of mains being added compared with 363 miles in 1949–50. In North Somerset, where the load has grown by 28 per cent in the last five years, nearly £300,000 is to be spent on system reinforcement, schemes under construction including a 132 kV bulk supply point at Churchill. Work was started on another bulk supply point at Bishops Hull, near Taunton. Exeter is now linked with Barnstaple by a new line between Crediton and Winkleigh which completes a ring main serving Central Devon and provides the "backbone" for rural extensions in this part of the Area. Other reinforcements have been carried out or are in hand at Barnstaple, Ilfracombe, Torquay, Dartmouth and in East Cornwall.

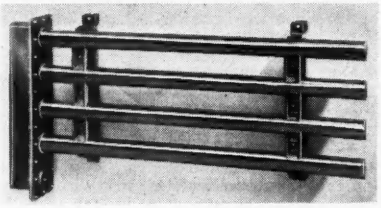
Ducts have been laid in the reconstructed roads in the centre of Plymouth and work has started on the primary network of a project costing nearly £300,000 to provide a new mains system for the city centre.

RECENT INTRODUCTIONS

NOTES ON NEW ELECTRICAL AND ALLIED PRODUCTS

Hoseproof Tubular Heaters

HEAVY-duty tubular heaters have now been developed by the ARORA COMPANY, Rosebery Street, Loughborough, as water-tight units to meet the requirements of Lloyd's Register of Shipping for hoseproof type heaters. The



Arora hoseproof tubular heaters

illustration shows a four-tier unit, but they are also made in single, two and six tiers or any other arrangement required. Since heavy-duty type elements are fitted, very high loadings can be provided where they are required for purposes other than space heating. As the heaters are suitable for industrial purposes only, they are not subject to purchase tax.

Miniature Soldering Iron

A miniature soldering iron (model 9) available from ORYX ELECTRICAL LABORATORIES, BCM/ORYX, London, W.C.1, has a $\frac{5}{32}$in detachable bit and is intended for universal use in the miniature field. With a rating of 9 W, it weighs only 0·25 oz and is available for operation on 6 or 12 V supplies.

Floor Polishing Accessories

The TRUVOX ENGINEERING CO., LTD., Truvox House, Exhibition Grounds, Wembley, is introducing two "Plus Packs" which render its "Juno" floor polisher suitable for complete floor treatment.

The "B" pack, which costs 27s and enables users to "dry-clean" polished floors, includes a stitched wire-wool pad that clips over the existing rotary brush. Large floors can be cleared of accumulated wax and dirt in a very short time, a rubber skirt (which replaces the stationary outer brush) preventing dust from rising into the air.

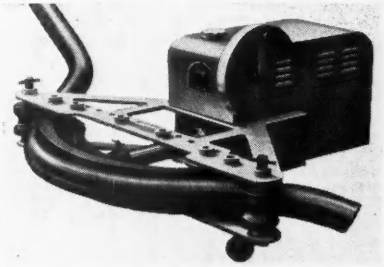
For treatment of badly scarred floors which need re-surfacing, the special sanding disc provided with the "A" pack (price 33s 6d) is clipped over the rotary brush. An additional felt pad ensures a firm grip between brush and sanding disc, the rubber skirt mentioned above being also supplied.

Wind-Driven Generators

Wind driven generating equipment made by Pleuger & Co., of Hamburg, Germany, under the trade name "Ventimotor" is being marketed in this country by R. HOLLAS MITCHELL & CO., 29, Bell Hill, Petersfield, Hants. At present only model VE 200, which has a rating of 22 W at 12 V, is available. Eventually there will be three larger models each of which will generate three-phase a.c. for driving a wind pump and simultaneously supply the average requirements for d.c. for lighting, radio, etc., and charge a small battery to provide a limited reserve of energy.

Motorized Hydraulic Tube Bender

Apart from the "Staffa" 2in motorized hydraulic tube bending machine, CHAMBERLAIN INDUSTRIES, LTD., Staffa Works, Staffa Road, London, E.10, is now making a 4in model. This machine has the same design features and available power as the 2in model, but a larger forming head allows the bending of cold and unloaded steel tubes from $\frac{3}{4}$in to 4in and also $\frac{3}{4}$in to 2in electrical conduit, while with an



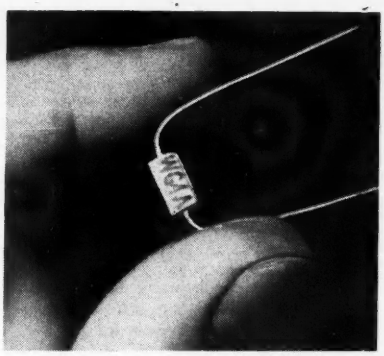
"Staffa" motorized hydraulic tube bending machine

Oryx model 9 miniature soldering iron

easily fitted attachment it will bend flat mild steel bars up to 7in by ¾in section. Hydraulic power is provided by a patented Beacham high pressure swash plate pump, mounted directly above a 15 ton, 20in stroke double action ram unit. The pump is driven by a 0·5 h.p. 220/380 V single-phase or 400/440 V three-phase motor.

Germanium Rectifiers

A range of germanium crystal rectifiers is now available from the WESTINGHOUSE BRAKE & SIGNAL CO., LTD., 82, York Way, London, N.1. These are of hermetically sealed construction and are only 0·5in long by $\frac{3}{16}$in diameter, the range of types covering peak working voltages up to 100 V and forward currents of 50 mA. They are suitable for detectors, limiters, instruments and general purposes, the self-capacity of all types being about 1 pF.



Westinghouse germanium crystal rectifier

Indian Electrical Imports

THE electrical import trade of India in the fiscal year 1950–51 declined by about 25 per cent from the 1949–50 level. Great Britain and the United States continued to be the main suppliers, with Switzerland noteworthy in the meter business, and the share of each showed about the same percentage decline.

The only noteworthy increases were in telegraph and telephone wires, cables, instruments and apparatus. Imports of other wires and cables, rubber insulated, rose slightly, but otherwise the cable trade decreased substantially. It will be recalled that there has been an appreciable increase in Ind.an manufacture of motors, batteries, accumulators, fans, lamps and telephone material.

Values of the principal lines of electrical imports in the 12 months ended March last are shown in the accompanying table with notes of increases or decreases compared with 1949–50.

Class	1950–51 Rs. (000)	Inc. or dec. on 1949–50 Rs. (000)
Fans and parts	3,23	— 3,61
From United Kingdom	2,62	+ 7
„ United States	3	+ 1
Wires and cables, not telegraph or telephone, rubber insulated	1,23,84	+ 29,01
From United Kingdom	1,08,30	+ 19,35
„ United States	3,29	+ 1,49
Ditto, insulation other than rubber	1,96,49	— 2,17,01
From United Kingdom	1,79,19	— 2,01,23
„ United States	1,18	— 3,65
Telegraph and telephone wires and cables	80,54	+ 64,05
Telegraph and telephone instruments and apparatus	1,03,97*	+ 52,85
Electric lamps	6,27	— 26,07
From United Kingdom	2,68	— 12,46
„ United States	2,29	— 5,02
Vacuum electric lamps	67	— 11,66
From United Kingdom	26	— 6,36
„ United States	7	— 44
Electric lamps for automobiles	4,42	— 11
Electric bulbs for torches	11,82	— 9,19
From Hongkong	4,33	+ 2,08
„ United States	2,32	— 2,91
Other electric lamps	27,88	— 1,36,36
From United Kingdom	2,26	— 3,29
„ Hongkong	20,15	+ 1,10,55
Radio apparatus	1,36,39	— 7,09
From United Kingdom	78,04	— 25,03
„ United States	32,02	+ 10,56
Batteries	16,74	— 23,52
From United Kingdom	13,48	— 8,01
„ United States	3,20	— 6,89
Accumulators and parts	24,31	— 4,84
From United Kingdom	19,26	— 3,15
Electric condensers	2,29	— 85
Electric bell apparatus	3,27	+ 27
Electric lighting accessories and fittings	20,80*	— 30,05
Meters	64,17	— 22,05
From United Kingdom	39,09	— 8,37
„ Switzerland	12,21	— 4,93
Other electrical instruments	16,75	+ 1,54
From United Kingdom	8,58	— 4,63
Electro-medical apparatus	34,12	+ 8,07
From United Kingdom	3,37	— 7,38
„ United States	13,75	+ 66
Switchboards other than telegraph and telephone	14,73*	— 9,94
Electrical porcelain ware	2,57	— 1,18
Electrical goods and apparatus not enumerated	1,30,65	— 18,14
Control and switchgear	3,64,41	— 85,76
Generators, alternators and dynamos	1,55,39	— 61,15
Motors	1,27,53	— 1,24,79
Transformers	1,50,55	— 9,17
Turbo-generator sets	64,58	+ 4,56
Other electrical machinery	3,06,89	— 45,87

* Mainly from United Kingdom.

ELECTRICITY SUPPLY

Shop Lighting Relaxation

Smaller Rise in Output

THE Minister of Fuel and Power has made a licence permitting a limited scale of lighting in shop windows and at entrances to restaurants, hotels and places of entertainment from 22nd October. Organizations representing traders have undertaken on behalf of their members that equivalent economies will be made inside the premises to compensate for any additional lighting used. The effect of the licence is that during the period when advertisement lighting is not permitted (from 7 a.m. to 7 p.m. on Mondays to Fridays, from 22nd October, 1951, to 4th April, 1952), from sunset until the premises close, a limited scale of lighting may be used to show that premises are open, to light shop windows and to illuminate menus and entertainment programmes.

The fittings used must not exceed in the aggregate, in the case of a shop, 100 W, or, if greater, 1½ W/sq ft of floor area of shop windows, and, in the case of other premises, 100 W for each entrance used by customers. The prohibition on the use of electricity supplied by an Area Board for other forms of advertisement lighting between 7 a.m. and 7 p.m. on Mondays to Fridays and the restrictions on the total wattage of lamps used in shops, hotels and places of entertainment remain in force.

Generation in September

A total of 4,462 million kWh was generated by the British Electricity Authority, the North of Scotland Hydro-Electric Board and the Lochaber Power Co. in September. The increase over the corresponding month of last year was 5·1 per cent, which continues the decline in the rate of expansion noticeable in recent months (April, 16·6; May, 12·4; June, 10·9; July, 9·0; and August, 8·8 per cent. In water power the 126 million kWh generated was 41 million less than in September, 1950.

Installed capacity at the end of last month aggregated 15,580 MW, against 15,461 MW at the end of August, a net addition of 119 MW during the month. The main items of new plant installed in B.E.A. power stations were as follows:—Croydon "B": 320,000 lb/hr Simon Carves boiler. Nechells: 230,000 lb/hr International Combustion boiler. Westwood (Wigan): 30 MW British Thomson-Houston set. Peterborough: 20 MW English Electric set. Fulham: 60 MW English Electric set.

N.E. Consultative Council

At the quarterly meeting of the North Eastern Electricity Consultative Council at Newcastle-on-Tyne it was reported that the Electricity Board had approved development schemes costing £947,208. These included 34 for housing and 27 for rural supplies. The report stated that 47 substations had been brought into operation in the Board's area while substations had been built to supply 37 villages and farms. In addition, high-voltage supplies had been afforded to 20 industrial and commercial consumers. During the quarter 80 farms had been connected compared with 113 in the corresponding period of last year.

The Board's development programme has been severely curtailed by restrictions on capital

	Fuel consumed Thousand tons		kWh generated Millions			kWh sent out Millions	Installed capacity (m.c.r.) MW
	Coal	Oil	Steam	Water power	Total*		
British Electricity Authority ..	2,549	4·3	4,316	34	4,357	4,099	14,987
North of Scotland	6	1·0	9	92	105	104	593
Total for September, 1951 ..	2,555	5·3	4,325	126	4,462	4,203	15,580
Corresponding total for September, 1950	2,446	5·0	4,065	167	4,246	4,013	14,636
Increase or decrease, per cent ..	+4·5	+6·0	+6·4	−24·6	+5·1	+4·7	+6·4
Total for year to date (nine months)	24,892	61·8	42,219	1,029	43,378	40,924	
Total for corresponding nine months of 1950	22,384	47·2	37,731	1,018	38,869	36,679	
Increase or decrease, per cent ..	+11·2	+37·3	+11·9	+1·1	+11·6	+11·6	

* The total includes 7 million kWh generated by oil engines and 3·8 million kWh by waste heat plants in September.

expenditure. At the end of September the Board was informed what its allocation would be for the current year and since then a careful review has been in operation to ensure that the money available was put to the best possible use. In the circumstances it was inevitable that a number of prospective consumers would be disappointed.

The report stated that early next year the new system of weekly collection of electricity accounts would be extended to 3,000 consumers in the Newcastle and Gateshead area and to 14,000 prepayment meter consumers at South Shields, 9,000 at Stanley, 3,000 at Seaham and 1,000 at Crook. The report added that the collection of quarterly electricity bills was becoming increasingly difficult.

Herefordshire Scheme Delayed

At a meeting of the Midlands Electricity Consultative Council at Hereford last week the secretary (Mr. P. W. Dickson) stated that after two public inquiries the Minister had given his consent to the erection of a 66 kV line into Herefordshire except for four spans over the brow of the Malvern Hills. This part would have to be put underground. As the Board was unable to get delivery for six months of the type of cable needed, it would not be possible to complete the supply into that part of Herefordshire this winter. Alderman H. Leason, chairman of the Council, remarked that if overhead lines had been allowed the work could have been done.

Lighting at the Pithead

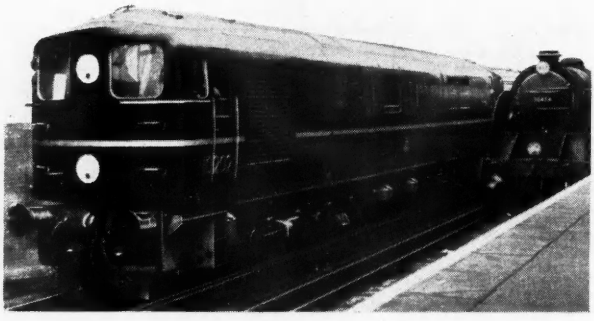
Fluorescent lighting now makes its contribution to improvements in appearance at Beynon Pit, Blaina, Mon, planned by the pit management. Ornamental gardens have been laid out at the pit top, near the miners' bath houses, and G.E.C. "Three-Eighty" fluorescent lanterns mounted on special 25ft Concrete Utilities columns have been installed along one side of the main roadway. The new lighting

New fluorescent lighting at Beynon Pit, Blaina

was planned and installed by the electrical engineering staff of the Monmouthshire No. 6 Area, National Coal Board.

Diesel-Electric Locomotive

Diesel-electric locomotive No. 10202 is the first of its kind to make a Southern Region main line run out of Waterloo. As reported in last week's issue, it went into regular service for the first time on 15th October when it hauled the 1 p.m., consisting of thirteen coaches, from Waterloo to Exeter and the West of England. The diesel engine and the electrical equipment were manufactured by the English Electric Co., Ltd., and the mechanical parts by British Railways. This type of locomotive weighs 135 tons and can be operated singly or in multiple units for hauling express passenger trains at speeds up to 110 m.p.h. It has a 16 cylinder (S.V.T. type) vee-form four stroke pressure charged diesel engine, developing 1,750 b.h.p., which drives an electric generator to supply power to six nose-suspended traction motors.



The Southern Region's first main line diesel-electric locomotive

FINANCIAL SECTION

Company Notes and Stock Exchange Activities

Reports and Dividends

Cable & Wireless, Ltd.—The report and accounts for the year ended 31st March last have been published as a White Paper. The group net profit for the year, before taxation and special appropriations, is £2,232,743, and compares with £1,893,699 for the preceding fifteen months. Taxation absorbs £1,196,988 and various appropriations £302,415. It is proposed to pay a dividend of 4 per cent for the year (against 5 per cent for the previous accounting period), and to carry forward £902,363 (against £923,926 brought in).

Newton Brothers (Derby), Ltd.—Speaking at the annual meeting on 8th October, Mr. F. V. Pipe (chairman) said that there were no signs at present of any falling off in the demand for their specialized products and by constant improvement of their plant and methods of production they were endeavouring to counteract as far as possible the effect of the rising costs of labour and materials.

Peto Scott Electrical Instruments, Ltd.—In our issue of 12th October we stated that the company was making a bonus issue of ordinary shares. This was incorrect. The company is issuing 450,000 ordinary shares of 2s each at par as a " rights " issue for cash on a one-for-one basis.

The British Electric Traction Co., Ltd., has declared an interim dividend of 7½ per cent, less tax, on the deferred ordinary and " A "deferred ordinary capital (unchanged).

Associated Electrical Industries, Ltd., announces that, as a result of the recent offer which closed on 30th September, 2,176,491 8 per cent " A " preference shares (out of a total issued of 2,669,240) have been converted into 4½ per cent " B " preference shares. The preference shares of both classes have now been converted into stock.

Hopkinsons, Ltd., have declared an interim dividend of 7½ per cent (unchanged).

The London Electric Wire Co. & Smiths, Ltd., is paying an interim dividend of 4 per cent (same) on larger capital.

Glenfield & Kennedy, Ltd., have announced an interim dividend of 5 per cent. less tax, on £1.400.000 ordinary as increased in May by a 100 per cent scrip bonus. The interim dividend in 1950 was also 5 per cent.

The Ever Ready Co. (Great Britain), Ltd., is maintaining its interim ordinary dividend at 15 per cent, less tax.

New Companies

Bailey Electrical, Ltd.—Registered 13th October. Capital £3,000. Manufacturers of and dealers in artificial lighting apparatus, electrical plant, wireless and television sets, etc. Directors : K. Bailey and J. Hall. Regd. office : 24a, Booth Street, Ashton-under-Lyne.

B. H. J. Electrical & Refrigeration (Cardiff), Ltd.—Registered 13th October. Capital £1,000. Electrical and refrigeration engineers, etc. Directors : J. Harley, R. L. Burchell and C. James. Regd. office : 20, Ninian Park Road, Cardiff.

Radar Components, Ltd.—Registered 17th October. Capital £10,000 Manufacturers of and dealers in electronic equipment of all kinds, etc. Directors : R. E. Davis and A. Deutsch. Regd. office : 105, Judd Street, W.C.1.

Joyce, Loebl & Co., Ltd.—Registered 6th October. Capital £2,000. To acquire the business of electrical and mechanical engineers and instrument makers carried on by Capt. R. H. Joyce and H. Loebl as Joyce Loebl & Co., at Newcastle-on-Tyne. Directors : H. Loebl and R. H. Joyce. Regd. office : Arch Works, Painters Heugh, Dean Street, Newcastle-on-Tyne.

Vernon Ashworth, Ltd.—Registered 9th October. Capital £3,000. To acquire the business of an electrical, radio and television engineer carried on by V. Ashworth, etc. Directors : V. Ashworth and H. G. Swindells (secretary). Regd. office : 592, Old Chester Road, Rock Ferry, Ches.

Ernest S. Till & Co., Ltd.—Registered 9th October. Capital £500. Electrical and general engineers, electrical installation contractors, etc. Directors : E. S. Till and R. W. Hardwick. Secretary : E. S. Till. Regd. office : Wolseley Hill, Redding Road, Eastville, Bristol, 5.

Johnson Neon (Liverpool), Ltd.—Registered 10th October. Capital £800. Manufacturers of hot and cold cathode luminous tubes and signs of all kinds, electrical contractors and engineers, etc. Directors : J. Dougherty and A. Johnson (secretary). Regd. office : 33, Baker Street, Liverpool, 6.

A. Good & Co., Ltd.—Registered 10th October. Capital £100. Manufacturers, wholesalers, importers and exporters of electrical appliances; electricians, etc. Secretary: M. Rabin. Regd. office: 203, Regent Street, London, W.1.

Suratel Products, Ltd.—Registered 11th October. Capital £150. Manufacturers of and dealers in dynamos, motors, armatures, etc. Directors: G. D. Underwood, J. C. Gilmour and N. G. Davson. Regd. office: 802/3, Oxford Avenue, Slough Trading Estate, Slough.

P. B. Turner & Co. (Electrical Contractors), Ltd.—Registered 11th October. Capital £1,000. P. B. Turner is the first director. Regd. office: 68, Wharf Road, Grantham, Lincs.

Increases of Capital

Lindley Thompson Transformer (Holdings), Ltd.—Increased by £329,900, in 99,950 6 per cent redeemable cumulative preference shares of £1 each and 4,599,000 ordinary shares of 1s each, beyond the registered capital of £100. Converted into a "public" company on 3rd October, 1951.

Smith & Ansell, Ltd.—Increased by £32,000, in £1 ordinary shares, beyond the registered capital of £18,000. At 22nd August, 1951, Falk, Stadelmann & Co., Ltd., held 28,283 shares out of 35,000 issued.

London Battery & Cable Co., Ltd.—Increased by £15,000, in £1 ordinary shares, beyond the registered capital of £5,000.

Explanation

The **Strong Electric Corporation (Great Britain), Ltd.**, states that confusion as to its position has arisen as a result of the voluntary liquidation of a subsidiary company—the Strong Illuminating Engineering Co., Ltd.—for the purpose of incorporating it into the parent company. The latter points out that all creditors were satisfied in full before the publication of the required statutory notice regarding the Strong Illuminating Engineering Co., Ltd.

Liquidations

Malme Electro-Medical Laboratories, Ltd.—Winding up voluntarily. Liquidator, Mr. W. A. Byars, 51, Coleman Street, London, E.C.2. Particulars of claims to the liquidator by 14th November.

The Sherborne Electrical Co., Ltd.—Particulars of claims by 9th November to the liquidator, Mr. E. B. Bate, Carlton Chambers, 25, Baldwin Street, Bristol, 1.

Edgworth Electrics, Ltd.—Particulars of claims by 24th November to the liquidator, Mr. A. W. Hunter, Walter House, 418-422, Strand, London, W.C.2.

Bankruptcies

F. Phillips, 28, Blenheim Terrace, St. John's Wood, London, N.W.8, electrical contractor, lately trading as F. Phillips & Son, at 28, Blenheim Terrace, St. John's Wood, N.W.8, as electrical contractors.—Receiving order made 10th October on debtor's own petition.

H. W. Daldry, lately carrying on business at 168, Bells Road, Gorleston-on-Sea, Suffolk, electrician.—Receiving order made 10th October on debtor's own petition. First meeting 31st October at the Official Receiver's office, Castle Chambers, Opie Street, Norwich. Public examination 22nd November at the Town Hall, Great Yarmouth.

H. Ward, 107, Aigburth Road, Liverpool, 17, radio, electrical and cycle dealer.—Last day for receiving proofs for dividend 2nd November. Trustee, Mr. R. P. Booth, 5, Rumford Place, Liverpool, 3.

L. E. Lawson, lately carrying on business at 1, Northam Road, Six Dials, Southampton, under the name of Lawson's Radio, as a radio and electrical engineer.— Last day for receiving proofs for dividend 30th October. Trustee, Mr. N. G. Randall, of Morgan & Co., 100, Park Street, Grosvenor Square, London, W.1.

A. Jacobs, 312, London Road, Westcliff-on-Sea, Essex, electrical engineer.—Order made 6th September suspending discharge for three months until 6th December, 1951.

R. L. Feggin, lately trading as "Tithebarn Radio Co." at 63, Tithebarn Street, Liverpool, and as "Crosby Radio Co." at 75, Crosby Road North, Waterloo, Liverpool, and as "High Bridge Radio Co." at High Bridge, Newcastle-on-Tyne, electrical engineer.—Last day for receiving proofs for dividend 2nd November. Trustee, Mr. A. K. Ferguson, East Africa House, 25, Water Street. Liverpool, 2, Official Receiver.

J. H. Bourne, carrying on business under the style of the "Amplifier Illumination Co." at Rayleigh Works, Powlett Street, Wolverhampton, electrical fittings and fancy goods manufacturers, and also carrying on business in partnership with another as E. Desborough & Sons at the same address, electro platers.—First and final dividend of 8d in the £. payable on or after 6th November at 12, Waterloo Road, Wolverhampton.

Cellulose Film Wrappings

LAST June the Board of Trade prohibited the use of transparent cellulose film for wrapping purposes for a number of classes of goods. Among them was insulating tape but now that has been removed from the list.

STOCKS and SHARES

STOCK Exchange markets and prices on the eve of the General Election maintained the firmness that had characterized them since the date of the election was first announced. Opinion ran in favour of a Conservative victory at the polls. With this in mind, investment has rendered steady support to shares in companies which, if the proposal of dividend limitation were to be abandoned, would be likely to go ahead with the hope of increased profit distributions. As has been pointed out in this page on many occasions, a number of the leading industrial undertakings, by sound finance and dividend restraint, have achieved a position of substantial financial strength. This in time augurs the possibility of a bonus in some shape or other, and justifies acceptance of what might be considered a modest rate of return on the money invested in the shares.

Many Rises

C. & A. Parsons, 5⅜, have been a good spot, but the principal movement was a rise of 6s 6d in Telephone Properties to 39s 6d, on the hope that, some time or other in the future, Venezuela might possibly make a bid for the company's undertaking. Cable & Wireless rose 2 to 124½ on publication of the figures. Several other advances included English Electric 70s, Lucas 43s 9d, Metal Industries 44s 9d, Tube Investments 6⅝, Henley's 24s 6d and Veritys 4s 6d. Among the few falls which occurred were Lancashire Dynamo 55s, and Babcock & Wilcox, which at 79s 3d showed $\frac{1}{16}$ loss. Reyrolle 46s 3d and E. K. Cole 19s 6d both went ex rights last Monday. The new shares are 46s 6d and 20s respectively. Radio Rentals hardened to 30s 9d and Ultra Electric to 5s 3d. Pye deferred at 23s 9d are $\frac{1}{16}$ up.

East African Power

News is expected before long in connection with an issue of fresh capital by the East African Power & Light Co., which supplies power in Kenya and Tanganyika. The 4 per cent final dividend declared last month maintained the total for 1950 at 7 per cent. This rate has been paid without a break for at least twenty years, on capital multiplied no fewer than seven times over by successive issues, mostly on bonus terms to shareholders. A further increase in profits shown in the latest accounts gives no sign of any check to the undertaking's progress. At 38s 6d, the ordinary shares pay a moderate £3 13s per cent on the money, a return which is evidently related to the scope believed to exist in East Africa's still undeveloped resources, and which is probably influenced, also, by the company's registration in Kenya. This frees profits from United Kingdom taxation, and gives the shares a particular attraction for overseas investors.

Radio and Television Trust

According to the full report now issued by this company, the directors remain of the opinion that the interests of stockholders will ultimately be served best by the disposal of the two operating subsidiaries, Britannic Electric Cable and Airmec Laboratories. With the prospect, however, of a continuing improvement in their position over the next few years, it is not intended to take immediate steps. Meanwhile, there has been a moderate reduction in overdrafts and accrued interest but the figure remains at over £880,000, and there is little change in the profit and loss account debit of £820,000, which is, by itself, not much short of the total issued capital and reserves. The company's 2s ordinary shares are quoted at about 9d and the preference shares at 3s 9d.

Lindley Thompson

Following the placing of 6 per cent preference and 1s ordinary shares of Lindley Thompson Transformer (Holdings), dealings began last week at prices of about 21s 3d and 1s 1½d respectively. Profits for the year ended in September are expected to be about £12,000 short of the previous figure of £87,000, but, with sixteen months' orders on hand at remunerative prices, the directors hope to see that level restored in a year's time. On that basis, they would recommend, in the usual course of events, an ordinary dividend of 12½ per cent. A reservation was made in the statement to the effect that, if dividends were to be limited by law to a lower rate, the difference would be placed to a dividend reserve. Dividend on the preference shares is covered eight times by the estimated profits of the past year. Capital of the company is £230,000 in ordinary and £100,000 in preference shares.

Motor Show

Two of the companies whose names are readily associated with the Motor Show are due to declare their final dividends and preliminary profits within a few weeks. They are Joseph Lucas and S. Smith & Sons (England), both of which closed their accounts about the end of July. As recently mentioned here, the Lucas payment has been the subject of hopeful anticipation on the strength of the tenfold earnings cover for last year's payment of 6⅔ per cent. S. Smith's dividend policy has also been on conservative lines. A dividend of 10 per cent has been indicated for the ordinary capital as it now stands, at a total of £1,690,000, divided into 4s shares. The latter were quoted at 9s 6d at the beginning of this week, and Lucas £1 ordinary at 43s 9d.

NEXT WEEK'S EVENTS

Monday, 29th October

BOURNEMOUTH.—Grand Hotel, Firvale Road, 8.15 p.m. A.S.E.E. Bournemouth Branch. Film show.

LEEDS.—Lighting Service Bureau, 24, Aire Street, 7 p.m. I.E.S. Leeds Centre., "Festival Year in Britain," by T. O. Freeth.

LONDON.—Savoy Place, W.C.2, 5.30 p.m. I.E.E. Radio Section. Discussion on "The Social Implications of Television," opened by F. H. Townsend.

MANCHESTER.—Engineers' Club, Albert Square, 6.30 p.m. Women's Engineering Society, Manchester Branch. "Some New Materials and their Application," by R. F. Archer.

Tuesday, 30th October

CHELMSFORD.—Marconi College. I.E.E. London Students' Section. District meeting. Film evening.

LONDON.—At the Royal Society of Tropical Medicine and Hygiene, Manson House, Portland Place, W.1, 7 p.m. Society of Instrument Technology. "Development of Materials for Instrument Manufacture," by E. B. Moss (president).

YORK.—Royal Station Hotel, 7 p.m. I.E.E. North Midland Centre. "The Control of Hydro-Electric Plant," by A. C. H. Frost and W. Brittlebank.

Wednesday, 31st October

CHATHAM.—Sun Hotel, 8 p.m. A.S.E.E. Kent Branch. Film show.

LONDON.—Savoy Place, W.C.2, 5.30 p.m. I.E.E. Supply Section. Chairman's Address, by R. Davis.

I.E.E. London Students' Section, 2.30 p.m. Visit to Sperry Gyroscope Co., Ltd., Brentford.

Connaught Rooms, W.C.2, 12.30 for 12.55 p.m. Batti Wallahs' Society. Luncheon. Speaker, General Lord Ismay.

Thursday, 1st November

CROYDON.—Café Royal, North End, 8 p.m. A.S.E.E. South London Branch. "Fluorescent Lighting," by H. Windebank.

KETTERING.—George Hotel, 8 p.m. I.E.E. East Midland Centre. Dinner-dance.

LEICESTER.—Demonstration Theatre, E.M.E.B., Charles Street, 6.30 p.m. I.E.S. Leicester Centre. "Lighting for Schools," by J. F. Roper.

NOTTINGHAM.—Demonstration Theatre, E.M.E.B., Smithy Row, 5.30 p.m. I.E.S. Nottingham Centre. "Modern Airport Lighting," by J. W. Morse.

Friday, 2nd November

BIRMINGHAM.—Imperial Hotel, Temple Street, 6 p.m. I.E.S. Birmingham Centre. Film evening.

LONDON.—Waldorf Hotel, W.C.2, 7 p.m. Institution of Works Managers. Annual general meeting.

MANCHESTER.—Engineers' Club, Albert Square, 6.45 p.m. Manchester Association of Engineers. "Modern Methods of Sound Reproduction," by J. R. G. Vernon.

WORTHING.—Assembly Hall. E.I.B.A. Sussex Centre. Annual ball.

TRADE MARK APPLICATIONS

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered up to 10th November.

CATHOWELD. No. 700,813. Class 7. Portable electric welding machines and parts, all included in Class 7. CATHOWELD. No. 700,814. Class 9. Electric welding apparatus and parts and fittings, all included in Class 9.—G. A. Lancaster (London), Ltd., 50, George Street, Croydon, Surre..

HOKLYKEM. No. 697,283. Class 9. Electro-plating machines, resistance boards being electrical apparatus included in Class 9, electric batteries, electric soldering irons, thermometers, shunt regulators, goggles, etc.—Hockley Chemical Co., Ltd., 1, Hockley Hill, Birmingham, 18.

BANK-LITE. No. 699,130. BANKO-LITE. No. 699,132. BANKOLITE. No. 699,134. All class 9. Insulated electric cables and block and socket switches. BANK-LITE. No. 699,131. BANKO-LITE. No. 699,133. BANKOLITE. No. 699,135. All class 11. Handlamps and lampholders.—Bankes & Lovelace, Ltd., 23, Old Burlington Street, London, W.1.

BELDRAY (design). No. 700,535. Class 9. Electric flat irons.—Bradley & Co., Ltd., Albion Works, Mount Pleasant, Bilston, Staffs.

HUMITEC. No. 700,802. Class 9. Hygrometers.—Standard Telephones & Cables, Ltd., Connaught House, 63, Aldwych, London, W.C.2.

DUSLOT. No. 700,812. Class 9. Prepayment mechanisms for commodity supply meters and parts included in Class 9.—Smith Meters, Ltd., 186, Kennington Park Road, London, S.E.11.

RONETTE. No. 700,888. Class 9. Piezo-electric crystal apparatus for scientific purposes.—"Ronette" Piezo-Electrische Industrie (Ronette P.E.I.) N.V., Amsterdam, Holland. Address for service, c/o F. J. Cleveland & Co., 28, Southampton Buildings, Chancery Lane, London, W.C.2.

HYLITER. No. B688,839. Class 11. Electric lighting fittings.—Courtney, Pope (Electrical), Ltd., Amhurst Park Works, adjoining 341, Seven Sisters Road, Tottenham, London, N.15.

FREEZONE. No. 699,274. Class 11. Refrigerators, refrigerating apparatus and refrigerating installations and parts of and fittings for all such goods, all included in Class 11.—Marco Refrigerators, Ltd., Manor Works, Rowan Road, Streatham Vale, London, S.W.16.

QUALITON. No. 699,362. Class 17. Insulators made of china.—Elektro-Impex Villamossagi es Finommechanikai Kulkereskedelmi Vallalat, Budapest, Hungary. Address for service, c/o W. P. Thompson & Co., 12, Church Street, Liverpool, 1.

Telephone Improvements

Several large telephone construction operations are taking place on Merseyside, as for example the provision of a new power junction cable between Liverpool and St. Helens; the transfer of Ormskirk exchange from manual to automatic working; and extensions to the Central and Childwall automatic exchanges.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (2s each) will be obtainable after 5th December from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1946

29539. Standard Telephones & Cables, Ltd., and Maddock, A. J.—Pressure and high-frequency dielectric heating apparatus. 26th September, 1947. (662431.)

37186. Robinson, J.—Electric control systems. 16th July, 1948. (662133.)

1947

19999. White, E. L. C.—Apparatus for stabilizing three-phase voltage supplies. 7th July, 1948. (662532.)

24197. Standard Telephones & Cables, Ltd., and Goodchild, F. D.—Manufacture of electric discharge devices. 27th August, 1948. (662433.)

1948

18487. Rose Bros. (Gainsborough), Ltd., and Rose, A. G.—Control of electrically driven vehicles. 6th July, 1949. (662439.)

21815. General Electric Co., Ltd., and Harrold, A. E.—Coil winding machines and methods of winding coils thereby. 17th August, 1949. (662440.)

31907. Marconi's Wireless Telegraph Co., Ltd., and Price, T. H.—Radio and like transmitters. 23rd August, 1949. (662539.)

1949

46. Napier & Son, Ltd., D., Cowdrey, C. L., and Kinsella, J.—Electrical heating apparatus for reducing or preventing the formation of ice on aircraft parts. 22nd December, 1949. (662540.)

429. Sylvania Electric Products, Inc.—Electron discharge devices. 6th January, 1949. (662145.)

1659. Fr. Sauter Akt.-Ges. Fabrik Elektrischen Apparate.—Remotely-controlled receiver. 20th January, 1949. (Cognate application 1660, 18th January, 1949.) (662447.)

2280. Naamlooze Vennootschap Philips' Gloeilampenfabrieken.—Radio-gramophones of the kind comprising a slidable turntable. 27th January, 1949. (662153.)

2488. Derby & Co., Ltd., and Meyer, H.—Luminescent materials for television screens. 23rd January, 1950. (662154.)

2676. National Research Development Corporation.—Circuit arrangements for use with electromagnetic particle accelerators. 16th January, 1950. (662341.)

2772. General Electric Co., Ltd., and Nattrass, W. A.—Electric primary batteries. 1st February, 1950. (662342.)

2915. Statter & Co., Ltd., J. G., and Marston, G. S.—Panel-mounted electric switchgear. 2nd February, 1950. 662344.)

3139. Naamlooze Vennootschap Philips' Gloeilampenfabrieken.—Electric arc welding. 4th February, 1949. (662453.)

3496. Avery, Ltd., W. & T.—Electrical contacts for use in association with weighing apparatus. 9th February, 1950. (662455.)

3653. Allmanna Svenska Elektriska Aktiebolaget and Baynes, S.—Trolleys for electric trolley wire conductor systems. 24th January, 1950. (662457.)

4383. British Thomson-Houston Co., Ltd.—Wire enamelling dies. 17th February, 1949. (662163.)

5385. Naamlooze Vennootschap Philips' Gloeilampenfabrieken.—Cross-bar switches for automatic telephone systems. 28th February, 1949. (662167.)

5507. Kolb, O. K., and Smith, E. O.—Magnetic sound recording and reproducing apparatus. 1st March, 1949. (662462.)

5665. Adie, K. S.—Electric inspection lamps. 2nd March, 1950. (662545.)

5695. Westinghouse Electric International Co.—Electrical insulation. 2nd March, 1949. (662465.)

5745. Minister of Supply.—Apparatus for detecting cracks in metallic structures. 18th January, 1950. (662169.)

6314. British Electrical & Allied Industries Research Association, and Mason, F. O.—Apparatus for testing electrical circuit interruptors. 6th July, 1950. (662549.)

6434. Philips Electrical, Ltd.—Multi-grid electric discharge tubes. 9th March, 1949. (662550.)

7477. Metropolitan-Vickers Electrical Co., Ltd.—Formation of solidified ends on members of metal braid or foil used as electric conductors. 28th February, 1950. (662553.)

7653. Moravian Electrical Engineering Works, National Corporation, and Klima, V.—Winding for armatures of commutator motors. 21st March, 1949. (662234.)

8146. Ekco-Ensign Electric, Ltd., and De Boo, W.—Holders for tubular electric lamps. 24th March, 1950. (662556.)

9132. Roulston, A. E.—Double action relays. 4th April, 1949. (662564.)

9357. Alkaline Batteries, Ltd.—Electric lamps. 4th April, 1950. (662182.)

9471. Westinghouse Brake & Signal Co., Ltd., Peter, L. H., and Sheppard, E. A.—Light signals. 27th February, 1950. (662566.)

9870. Standard Telephones & Cables, Ltd.—Electron-discharge devices. 6th April, 1950. (662567.)

10023. Imperial Chemical Industries, Ltd., and Doble, S. M.—Electrically aided plant for de-watering aqueous slurries. 13th April, 1950. (662568.)

11668. Radio Corporation of America.—Diversity receiver apparatus. 2nd May, 1949. (662245.)

11872. Laurence Industrial Instrument & Control Co., Ltd.—Condenser-charging regulators for electric circuits of photo-flash equipment. 13th January, 1950. (662473.)

12318. Kolb, O. K., and Smith, E. O.—Apparatus for reproducing magnetic sound records. 9th May, 1949. (662475.)

12535. Measurement, Ltd., and Wolfenden, R. H.—Brake magnets of electricity meters and the like. 3rd April, 1950. (662476.)

12860. Metropolitan-Vickers Electrical Co., Ltd.—Control gear for electric motors. 4th April, 1950. (662249.)

13297. British Surgical Industries, Ltd., and Soget, M. L. M.—Amplification means for telephones. 18th May, 1949. (662188.)

13381. Kiely, D. G., Evans, G. S., and Buckingham, J.—Wireless aerials. 19th May, 1949. (662479.)

13707. Igranic Electric Co., Ltd.—Control of polyphase slip-ring induction motors. 23rd May, 1949. (662255.)

13979. Westinghouse Electric International Co.—Electron-optical systems. 25th May, 1949. (Addition to 652451.) (662569.)

14006. Thornton, A. A. (Warner Electric Brake Manufacturing Co.).—Eddy-current members for eddy-current brakes. 25th May, 1949. (662259.)

14024. General Electric Co., Ltd., and Mawson, R.—Thermionic valve oscillator circuits. 11th May, 1950. (662261.)

14845. British Thomson-Houston Co., Ltd.—Synchronous motor control systems. 2nd June, 1949. (662266.)

15197. **Thomson Electric Welder Co.**—Control mechanism for welding by pressure. 7th June, 1949. (662487.)

15356. Aircraft-Marine Products, Inc.—Strips of electrical cable connectors. 9th June, 1949. (662273.)

15514. Philips Electrical, Ltd.—Electric discharge tubes. 10th June, 1949. (Addition to 647375.) (662278.)

15579. Tesla, National Corporation, and Carniol, B.—Device for tuning and measuring the band width of band pass filters or separate oscillatory circuits. 10th June, 1949. (662280.)

15864. Sadir Carpentier.—Directional aerial system. 14th June, 1949. (662576.)

16165. T.I. (Group Services), Ltd.—Electrical high-frequency induction heating apparatus. 24th July, 1950. (662581.)

16321. Westinghouse Electric International Co.—Steam turbine apparatus. 20th June, 1949. (662371.)

16493. Dixon, M. G. (Robertshaw-Fulton Controls Co.).—Electric temperature control systems. 21st June, 1949. (662492.)

16547. Scholes & Co., Ltd., G. H., Pearce, F. J., and Pearce, G. S.—Electric switches and contact arrangements therefor. 11th July, 1950. (662373.)

16791. Standard Telephones & Cables, Ltd., and McLeod, T. S.—Electric frequency modulation systems of communication. 24th June, 1949. (662494.)

16984. Radio-Industrie Soc. Anon.—Scanning devices for television receivers. 27th June, 1949. (662194.)

17487. British Thomson-Houston Co., Ltd.—Voltage regulators. 1st July, 1949. (662295.)

18229. Thorpe, Ltd., F. W., and Thorpe, F. W.—Beaded electrical cables. 11th July, 1950. (662300.)

18324. Svenska Turbinfabriks Aktiebolaget Ljungstrom.—Means for balancing the axial thrust of elastic fluid compressors and turbines of the axial flow type. 11th July, 1949. (662301.)

18325. Svenska Turbinfabriks Aktiebolaget Ljungstrom.—Rotors for axial flow elastic fluid compressors and turbines. 11th July, 1949. (662302.)

18605. British Thomson-Houston Co., Ltd. (General Electric Co.).—On-load tap-changing circuits particularly for transformers. 14th July, 1949. (662499.)

19362. Philips Electrical, Ltd.—Switches suitable for use in electrically-driven gramophones. 22nd July, 1949 (662586.)

19884. Radio Corporation of America.—Controlled wave energy generators. 28th July, 1949. (662505.)

19943. Standard Telephones & Cables, Ltd.—Telephone set. 29th July, 1949. (662380.)

19945. English Electric Co., Ltd.—Centrifugal apparatus. 31st July, 1950. (662506.)

19986. British Thomson-Houston Co., Ltd.—Methods of and apparatus for manufacturing electric condensers. 29th July, 1949. (662306.)

20382. Lucas, Ltd., J.—Electric conductor trimming apparatus. 3rd August, 1950. (662507.)

21055. Syncro Machine Co.—Apparatus for annealing electrically heated moving wire. 12th August, 1949. (662387.)

21228. British Thomson-Houston Co., Ltd.—Methods of and apparatus for manufacturing electric condensers. 15th August, 1949. (662308.)

21322. Martin, M. E.—Electromagnetic power device. 30th July, 1946. (Divided out of 662132.) (662207.)

21729. Philips Electrical, Ltd.—Automatic gain-control circuits for television receivers. 22nd August, 1949. (662594.)

22204. Standard Telephones & Cables, Ltd.—Electrical amplifier and receiver system. 26th August, 1949. (662391.)

22914. British Thomson-Houston Co., Ltd.—Power-transmission gearing. 5th September, 1949. (662601.)

23101. Electrolux Corporation.—Commutators. 6th September, 1949. (662603.)

23146. Naamlooze Vennootschap Philips' Gloeilampenfabrieken.—Voltage comparison devices. 7th September, 1949. (662215.)

23209. **Pritchett & Gold & E.P.S. Co., Ltd.**—Electrical storage batteries. 18th July, 1950. (662604.)

24159. Westinghouse Electric International Co.—Electrodeposition of copper. 20th September, 1949. (662217.)

25170. Philips Electrical, Ltd.—Pulse-code modulation communication systems. 30th September, 1949. (662611.)

25980. Reuters, Ltd., Bartlett, S. C., and Stoner, C. P.—Remotely controlled radio receiving systems. 10th October, 1949. (662520.)

27258. Elektrokemisk Aktieselskapet.—Electric furnaces. 24th October, 1949. (662403.)

27430. Atkinson, J.—Turbine or like rotors. 23rd July, 1948. (Divided out of 630395.) (Cognate application 27431, 20th January, 1948.) (662527.)

27703. United-Carr Fastener Corporation.—Electrical socket connectors. 28th October, 1949. (662406.)

28195. Telefonaktiebolaget L. M. Ericsson.—Arrangement for signalling over a two-wire line. 3rd November, 1949. (662222.)

28483. British Thomson-Houston Co., Ltd.—Electric circuit interrupters. 7th November, 1949. (662311.)

28807. Desoutter Bros., Ltd., and Desoutter, R. C.—Portable power tools. 11th April, 1950. (662411.)

30775. Bullers, Ltd., and Hatfield, W. H.—Electric insulators. 2nd June, 1950. (662322.)

31257. Forges & Ateliers de Constructions Electriques de Jeumont.—Frequency control of convertor sets or groups. 6th December, 1949. (662623.)

32331. Western Electric Co., Inc.—Relay circuits. 16th December, 1949. (662424.)

33364. Teletype Corporation.—Electric switches suitable for telegraph transmitters. 30th December, 1949. (662428.)

1950

2493. Robinson, J.—Electric suppression systems. 16th July, 1948. (Divided out of 662133.) (662227.)

Amended Specifications

644821. Metropolitan-Vickers Electrical Co., Ltd., and another.—Jointing of metals by electrical induction heating.

650137. Dutilh, J. R. H.—Electromechanical phase shifter.

Welding and Health

AN investigation into the possibility of ill-health arising from the welding process has been carried out by the Factory Department of the Ministry of Labour and National Service and the results have been published in a book entitled "The Health of Welders" by A. T. Doig, M.D., Medical Inspector of Factories and L. N. Duguid, B.Sc., A.M.I.Mech.E., M.I.W. (H.M. Stationery Office, price 3s post free). The investigation consisted of a survey of the various types of welding followed by clinical examination of some 250 welders in different industries. Among the conclusions reached it is stated that "arc eyes," from which electric welders may suffer, has no permanent effect on the vision. Electric welders suffer to a greater extent than other workers from a slight superficial inflammation of the eyelids. General recommendations are made and it is suggested that close localized exhaust ventilation should be applied where articles are electrically welded on benches or stands. In the welding of large articles of mild steel, such as vehicles or prefabricated parts of bridges, general ventilation should be relied upon if good practical methods of localized exhaust cannot be evolved.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section, the date of the issue is given in parentheses.

Ashford (Kent).—15th November. U.D.C. Street lighting equipment. (See this issue.)

Australia. — BRISBANE. — 12th December. Capricornia Regional Electricity Board. Radio communication equipment. (C.R.E. (I.B.) 73008/51. Ten/3090.)*

Belfast.—23rd November. Electricity Department. Sluice valves, penstocks and road transport weighbridge at Victoria power station. (See this issue.)

Belgium. — BRUSSELS. — 7th November. Belgian State Railways. Supply of 1,525 conductor microtelephone connections. (C.R.E. (I.B.) 73451/51. Ten/3112.)*

8th November. Ministry of Colonies. Supply of telephone cable, wire and junction boxes. (C.R.E. (I.B.) 73280/51. Ten/3111.)*

Pakistan. — KARACHI. — 6th November. Department of Supply and Development. Supply of diesel oil or petrol engine alternator sets. (C.R.E. (I.B.) 73439/51. Ten/3114.)*

Peterborough.—City Council. Electrical installations in 14 shops, branch library, 16 flats and 14 garages and stores. (See this issue.)

Portugal.—LISBON.—12th December. Directorate General of Hydraulic Services. Supply of electro-mechanical equipment for the Campilhas hydro-electric station. (C.R.E. (I.B.) 7394/51. Ten/3126.)*

Rugby.—17th December. Borough Council. Four sets of electrically driven vertical propeller pumps, and two electrically driven vertical sludge pumps, for the sewage treatment works. Specifications from John Taylor & Sons, Artillery House, Artillery Row, London, S.W.1.

Southern Rhodesia. — SALISBURY. — 30th January. Southern Rhodesian Electricity Supply Commission. Supply of one 10,000 kW turbo-alternator, condensing and evaporating plant, pipes, valves and fittings for Shabani No. 2 power station. (C.R.E. (I.B.) 72881/51. Ten/3100.)*

Southport.—6th November. Borough Council. Electrical installations in 182 houses on the Essex Road Estate. Specifications, forms, etc., from the borough architect, Pavilion Buildings, Lord Street.

Uruguay.—MONTEVIDEO.—26th November. Usinas Electricas y Telefonos del Estado. Supply of 300,000 metres of double vulcanized insulated conductors. (C.R.E. (I.B.) 73234/51. Ten/3115.)*

5th November. Administracion Municipal de Transportes Colectivos de Montevideo. Supply of 11,800 metres of cable. (C.R.E. (I.B.) 73237/51. Ten/3116.)*

*Specifications may be inspected at the Commercial Relations and Exports Department, Board of Trade, Thames House North, Millbank, S.W.1 (Victoria 9040).

ORDERS PLACED

Folkestone.—Corporation. Recommended. Electrical installations in 40 houses at Biggins Wood estate (£1,151).—G. D. Edwards, Wilesborough.

Hull.—Corporation Welfare Services Committee. Recommended. Electrical installation in proposed Home at junction of Great Thornton Street and St. Luke Street (£1,451).—T. A. Garness, Ltd.

Education Committee. Installation of electric lighting in St. George's Road School (£979).—W. Marlow, Withernsea.

London.—CHELSEA.—South West Metropolitan Regional Hospital Board. Recommended. Installation of main electrical switchgear and cables at St. Stephen's Hospital, Chelsea (£4,232).—William Steward & Co., Ltd.

CONTRACTS IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Aldershot.—Library for Hampshire C.C.; Maxwell Aylwin & Reginald Kemp, architects, High Street, Alton.

Barrow-in-Furness. — First section of central college of further education, Howard Street; Cruickshank & Seward, architects, 16, Princess Street, Manchester, 1.

Birkenhead.—Houses, Prenton Dell Estate; H. G. B. Construction Co. (Liverpool), Ltd., Hoylake Road, Moreton (36 houses) and Dell Investments, Ltd., Russell Road, Runcorn (25).

Birmingham.—Three-storey extension at "D" block, Selly Oak Hospital; D. Goldfinch, architect to Regional Hospital Board, 10, Augustus Road, Birmingham.

Police houses, Hawkesley Farm, Woodthorpe Farm and Shand End estates (41), for Watch Committee; H. J. Manzoni, city engineer, Council House.

Blackpool.—Factory, Mowbray Drive; Cameron Confectionery Co., Ltd., 4, Cameron Avenue.

Maternity and child welfare clinic at Layton; N. A. Robson, Ltd., Blackpool Old Road, Highfurlong.

Bootle.—Hostel for aged people at 47, Balliol Street (£34,950); George Platt & Sons (Liverpool), Ltd., Oakes Street, Liverpool.

Cardiff.—Crematorium, Thornhill (£63,300); A. N. Coles, builders, Sutton Road, Plymouth.

Caterham. — Dwellings (64), Blanchmans Farm, for U.D.C.; Walter Smith & Partners, builders, 556, Limpsfield Road, Warlingham.

Chesterfield.—Houses (100), Newbold estate; A. F. White, 198, Derby Road, Chesterfield.

Junior school, Newbold; Wilcockson & Cutts, architects, 12, Saltergate, Chesterfield.

Chichester.—Works depot, Westhampnett Road site (£40,000); R. A. J. Cork, borough surveyor, North Street.

Darlington.—Houses (38), Aycliffe, for R.D.C.; Hutton & Hutton, architects, 24, Southend Avenue.

Dodworth.—Houses (64), South Road and Miners' Welfare Recreation Ground sites; L. Willoughby, housing officer, Council offices, Dodworth, Barnsley.

East Grinstead.—Flats & houses (40), Blackwell Farm estate; B. J. Cornelius, U.D.C. surveyor, East Court.

Felixstowe.—Houses (28) and five shops with flats, for U.D.C.; clerk, Town Hall.

Frome. — Divisional headquarters, courts, houses, etc. (£56,000), for County Standing Joint Committee; Somerset County architect, Taunton.

Gateshead.—Second hostel at Beacon Lough for old people for the T.C.; chief architect, Municipal Buildings, Gateshead.

Houses (197), Wrekenton North site; chief architect.

Grantham.—Bungalows (16), Cherry Holt, shops and flats at the corner of New Beacon Road and Harrowby Lane, and shops and flats at the corner of Harrowby Lane and Edinburgh Road; borough architect and surveyor.

Jarrow-on-Tyne.—Flats (18), High Street; H. W. T. Perkins, borough engineer.

Leeds.—Ambulance station at Saxton Lane for T.C. (£52,500); Pickard & Co., Dorrington Street, Leeds.

Liverpool.—Factory, Kirkby estate, for Standard Motor Co., Ltd.; Garlicks, Ltd., Far Gosford Street, Coventry.

London.—HAMPSTEAD.—Old people's hostel, West Heath Gardens; Riley & Glanfield, architects, 6, Raymond Buildings, W.C.1.

ST. PANCRAS.—Flats (70), Plender Street; Guy Morgan & Partners, architects, 36, Upper Mall, W.6.

STREATHAM.—Gymnasium, classrooms and lecture hall, Philippa Fawcett Training College, Leigham Court Road; Poulton & Freeman, architects, 15, Robert Adam Street, W.1.

Longbenton.—Proposed trading estate at West Moor; surveyor, U.D.C. Offices, Forest Hall, Newcastle-on-Tyne.

Maldon.—Nurses' home, St. Peter's Hospital; Adams, Holden & Pearson, architects, 2/4, Gordon Square, W.C.1.

Mexborough.—Additional accommodation at Montagu Hospital; Frank Haslam, Ltd., 4, Regent Terrace, Doncaster.

Middlesbrough.—Additions to the West Lane Hospital for Newcastle Hospital Board (£45,300); John Proud, Ltd., builders, York Road, West Hartlepool.

Newcastle-under-Lyme.—Pithead baths at Silverdale Colliery for N.C.B.; Wood, Goldstraw & Yorath, architects, Tunstall, Stoke-on-Trent.

Norwich.—Secondary modern girls' school, Bluebell Road (£161,030); H. C. Rowley, city engineer, City Hall.

Nottingham.—Large extensions at University; John Cawley, Ltd., 151, Canal Street.

Oldham.—C. of E. church, Fitton Hill estate; Leach, Rhodes & Walker, architects, 90, Deansgate, Manchester.

Redhill.—Office block and out-patients' department at County Hospital (£117,700); South West Metropolitan Regional Hospital Board.

Sheffield. — Additional accommodation at Etwall Rehabilitation Centre for Regional Hospital Board (£63,152); Ford & Weston, Ltd., Osmaston Road, Derby.

Smethwick.—Houses (238), Lyttleton Hall estate; borough engineer.

Major extensions to Chance Technical College; Edward A. Pearce & Partners, electrical and heating consultants, 24, St. Anne's Road, Harrow.

Southampton. — Heathfield school (480 places), Valentine Avenue, Sholing; town clerk, Civic Centre.

Sunderland.—Old people's homes at Hill View; borough architect, Grange House, Stockton Road.

Swansea.—Commercial buildings (£80,000), College Street; City & Town Buildings, Ltd., 1, Queen Street, London, E.C.4.

Thetford.—Fire station; Norfolk county architect, 27, Thorpe Road, Norwich.

Wakefield. — Works canteen; Translucent Glass, Ltd., Grantley Street.

Wallsend.—Modified scheme for extending Wallsend Baths (£10,000); P. L. Browne, Son & Harding, architects, Pearl Buildings, Newcastle-on-Tyne.

Welwyn Garden City.—Research block for Imperial Chemical Industries, Ltd., Plastics Division, Black Fan Road; Holland and Hannen & Cubitts, Ltd., builders, 1, Queen Anne's Gate, S.W.1.

West Ham.—Houses (15), flats (11) and houses (30), The Village, E.15, and maisonnettes (26), Plymouth Road, E.16; Thomas E. North, planning officer, 70, West Ham Lane, E.15.

West Hartlepool.—Houses for T.C. Builders (all local firms): Watt Brothers, Ltd. (50); C. M. Yuill, Ltd. (50); J. Proud, Ltd. (8); Stonehouse, Ltd. (12); Taylor & Evans (48); W. W. Brazell, Ltd. (48); T. A. Young (6); J. Peel (12); W. Brazell (West Hartlepool), Ltd. (16) and Spaldin & Snaith (6).

Whitehaven.—Conversions at Ingwell Mansion, for special residential school for sub-normal children; Cumberland county architect, 15, Portland Square, Carlisle.